Public Service Commission of Wisconsin Office of Energy Innovation
Critical Infrastructure Microgrid and Community Resilience Center Pilot Grant Program

ATTACHMENT A - COVER SHEET

SECTION I - Provide information summarizing the project proposal.				
Project Title:	Sun Prairie Public Library Micro grid + Community Resiliency Center			
PSC Grant Request ($):	**Applicant Cost Share ($):**	**Project Total ($):**		
$45,000	$17,084	$66,584		
Choose one Eligible Activity				
☐ Critical Infrastructure Microgrid Feasibility Study Level 1 and 2	☐ Critical Infrastructure Microgrid Feasibility Study Level 3	☒ Community Resilience Center Feasibility Study		
SECTION II - Provide information for your organization, signatory, and primary contact for the project.				
Applicant Type:	☒ City	☐ Village	☐ Town	☐ County
☐ Tribal Nation	☐ Wisconsin Technical College System			
☐ University of Wisconsin System	☐ K-12 School District	☐ 501(c)(3) nonprofit		
☐ Municipal Utility (water, wastewater, electric, natural gas)	☐ Hospital (public or nonprofit)			
Name (on W-9):	City of Sun Prairie			
Address (on W-9):	300 E Main St., Sun Prairie, WI 53590			
County or Counties Served by Project:	Dane			
DUNS Number or CAGE Code:	DUNS: 094367547 CAGE: 6WTT3			
NAICS Code:	921120 – Legislative Body			
Authorized Representative/Signatory (Person authorized to submit applications and sign contracts)		**Primary Contact** (if different from Authorized Representative)		
Name:	Aaron Oppenheimer	**Name:** Scott Semroc		
Title:	City Administrator	**Title:** Sustainability Coordinator		
Phone:	608-825-1193	**Phone:** 608-381-5553		
E-mail:	aoppenheimer@cityofsunprairie.com	**E-mail:** ssemroc@cityofsunprairie.com		
Signature of the Authorized Representative				

City of Sun Prairie
Public Library Microgrid+CRC

Summary of Project Budget				
Line	**Description**	**PSC Grant Request**	**Applicant Cost Share**	**Total Project Cost**
1	Personnel		$17,084	$17,084
2	Fringe			$0
5	Travel			$0
6	Contractual	$45,000	$4,500	$49,500
7	Other			$0
8	Indirect			$0
	Totals	$45,000	$21,584	$66,584
	% of Total	**68%**	**32%**	

Applicant Comments: The $45,000 PSC Grant Request, Contractual is meant to include the following services - Slipstream will provide the technical support for the feasibility analysis. Slipstream will be responsible for the creation of the plan, including the systems sizing analysis, financial analysis, and environmental analysis. The $17,084 Applicant Cost Share Personnel is meant to include Sun Prairie staff (computed at a mixed rate of ~$40-70/hour for sustainability, library, administration, EMS, and media center staff contributing to the feasibility study) assuming a six month project period and approximately 350 total staff hours distributed across relevant contributing city staff. The $ Applicant Cost Share Contractual is meant to include the 10% of Slipstream's total hours as cost share for technical analysis. The project also anticipates that additional third party staff will contribute (WPPI Energy, FEH Design), but these values will vary and were not computed as a result.

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Application Narrative

Project Description

The Sun Prairie Library wants to serve as the first Community Resiliency Center (CRC) in Sun Prairie. We propose a feasibility study that explores the expansion of its existing capabilities to effectuate this goal. The study will focus on integrating a 100+ kW solar PV array and a battery energy storage system (BESS) into a microgrid. This would serve critical loads such as HVAC, lighting, computers/laptops, and the Sun Prairie Media Center (located in the library) in the event of a power failure, emergency, or natural disaster. The microgrid would enable the library to provide additional CRC services to the community.

This is an exciting opportunity to operationalize the findings from this proposed feasibility study, as the Library Board has already approved renovation and expansion, which is currently in the early design stages. Early conversations on conceptual design are underway, with a target of December 2021 for draft renderings to be presented to the Library Board.[1] Leading up to that date, several meetings will be held between Library staff, city staff, the community, and FEH Design. In late July 2021, this feasibility study was highlighted in a design team meeting, which included FEH Design staff, the Library Board President, a City Council member, the city's Sustainability Coordinator, and Library staff. All stakeholders gave verbal support to proceeding with the grant and FEH Design and the Library Director provided a written letter of support, included in this submission.

A microgrid project aligns with the stated goals for success for the expansion and renovation. Goals for success include: 1) ensure the library as an essential destination for the community during emergencies as a CRC, 2) ensure the spaces and services honor the library's commitment to diversity, equity, and inclusion, 3) improve infrastructure for comfort, aesthetics, safety, and security, 4) ensure the library as an essential destination for the community, 5) demonstrate good stewardship by being financially, environmentally, and culturally sustainable, and 6) facilitate internet and broadcast communications during outages.

Built in 1998 and located at 1350 Linnerud Drive, Sun Prairie WI 53590, the Sun Prairie Public Library's mission is to serve the community as an activity center. They support lifelong learning by providing educational, cultural, and recreational opportunities for all people with a vision to serve as a dynamic, positive force in the community. The library connects residents with the world of ideas, literacy, literature, and information and aspires to create opportunities for all residents to participate, connect, and discover innovative, traditional, and emerging library resources and services.

With this mission in mind, the facility already serves a variety of functions that meet the current working definition of a CRC:

- The library community room is designed as a storm shelter room, with thicker walls and shutters that can allow it to serve as a hardened shelter during emergencies.

[1] The preliminary design can be found here: https://www.sunprairiepubliclibrary.org/architectural-analysis.

- The library serves as a vaccine clinic. During three clinics in May, June, and July 2021, the City of Sun Prairie distributed ~70 vaccines in the community. Currently, the library works with the City of Sun Prairie, Sun Prairie Emergency Medical Services (EMS), and Public Health Madison and Dane County (PHMDC) to support messaging.
- The library is used heavily by under-resourced members of the community for a variety of critical activities and resources, including telehealth appointments, food assistance, online bill payment, tax forms, test proctoring, academic and career test preparation, broadband access, and workforce development, including resume creation, job searching, and career coaching.
- The library hosts non-profit and community action organizations (Tenant Resource Center, Shelter from the Storm Ministries, and Project Recovery) that directly assist residents with various critical services, including workforce development programs, rental assistance, Covid-19 related resources, and mental health resources.

The library would benefit immensely from a feasibility study to justify expansion of community services and the addition of more functions directly related to a CRC through installation of a backup power system. The system could serve a dual role: 1) emergency operation which switches the system to islanded operations, running critical loads off the battery which can be recharged with solar PV, and 2) provide benefit during normal operation through grid services and battery controls that would incorporate solar PV and grid electricity supply.

In the case of an outage or emergency event, the ability of this site to function as a microgrid would allow the library to provide several additional functions of a CRC, including:

- **Utilization of the storm shelter during power outages.** Currently, if the power fails, staff and patrons must clear the building. With a backup system in place, the building and existing storm shelter could become a designated refuge during storms and power outages.
- **Heating and cooling center.** As a trusted and centrally located organization in the community, it would be a natural fit for the library to serve as a heating and cooling center during emergency situations. The feasibility study would allow Sun Prairie to understand the sizing of a BESS needed to provide this benefit during potential outages or periods of extreme outdoor temperatures, especially since HVAC equipment could fail elsewhere in the community.
- **Phone and electronic charging station.** Another vital service to provide residents during power outages is a phone and electronic charging station. As this location is centrally located for most residents, it can easily serve this function.
- **Electric Vehicle (EV) infrastructure charging**. As electric vehicles are adopted both by residents and the municipality, this site could serve as one of the few places to charge vehicles during an outage. This could be particularly important as the city begins to adopt electric emergency vehicles.
- **Media Center community emergency broadcasts/communications.** During an emergency situation, the Media Center located in the facility could provide emergency broadcasts and communications. In the case of a power outage, this functionality is currently eliminated. The addition of a backup power system would enable continued communications to the community from the Media Center.

In addition to these primary CRC benefits, the feasibility assessment would explore the additional benefits the microgrid could provide during routine operation, including:

- **Peak demand reduction and additional kWh savings for the site.** Sun Prairie library could optimize control of the BESS and solar system on normal days to decrease peak demand charges and produce kW savings. The system would also allow for increased on-site consumption of solar energy. Utilization of time-of-use rates through SPU could bolster these savings as well.
- **Peak demand shaving for the grid, through control by the utility.** Through joint operation of the system, the utility could utilize the microgrid to shave peak demand to alleviate distribution congestion on the grid.
- **Carbon savings.** The addition of solar panels and a BESS will lead to carbon and greenhouse gas (GHG) emissions savings by increased consumption of renewable energy. This system will also avoid the need for a fossil-fuel generator to be added for backup, which would avoid substantial GHG emissions.

Overall, the project would enable the library to meet its goals with a design that would improve the facility's infrastructure in terms of comfort, aesthetics, safety/security, sustainability, and equity, benefiting the community. The feasibility study would also provide a way for Sun Prairie, in conjunction with Sun Prairie Utilities (SPU) and WPPI Energy, to explore key configuration, controls, financing, and safety concerns of batteries and microgrids, with a particular focus on:

1) Requisite BESS size and sizing of PV to serve critical loads during an outage
2) Logistics of controls and wiring to switch from grid-connected to islanded operation
3) How the microgrid could provide peak demand reduction during grid-connected operation
4) Asset ownership and costs associated with different ownership structures

Reference Materials List

The following references are included:

- Slipstream Qualifications
- Letters of Support (SPU, WPPI, FEH Design, Slipstream, Sun Prairie Dept. Heads)
- Analysis of Expansion Options for Sun Prairie Public Library, FEH Design Feb. 2020
- Facility Condition Assessment Narrative, FEH Design May 2018
- Municipal Energy Plan – Community Specific Chapters – Sun Prairie
- Slipstream Resumes
- Sun Prairie Hazard Identification & Risk Assessment information, County of Dane
- 2019 Sun Prairie Library Fast Facts
- 2020 Sun Prairie Library Racial Literacy Plan
- Sun Prairie Core Values
- Sun Prairie One Page Strategic Plan

Merit Review Criteria

Key Partners and Stakeholders

The key partners will include the City of Sun Prairie and Slipstream. City of Sun Prairie will lead the project, while Slipstream provides technical support for the feasibility analysis. Sun Prairie will be responsible for stakeholder coordination as well as data compilation of the library. The key point of contact at Sun Prairie will be the Sustainability Coordinator. Slipstream will be responsible for the creation of the plan, including the systems sizing analysis, financial analysis, and environmental analysis.

Key departments from the City of Sun Prairie, including the Library, Media Center, and EMS, will support the project by providing input on services needed through the CRC and backup duration as needed. The UW-Madison Electrical and Computer Engineering Department will also be considered for technical assistance, as needed throughout feasibility study. Each of these stakeholders has provided a letter of support for this project or agreed to support.

Slipstream, a nonprofit organization based in Madison with a mission to accelerate climate solutions for everyone, has worked previously with Sun Prairie during their energy plan,[2] funded through OEI's 2018 Energy Innovation Grant. Through that energy plan, Slipstream helped Sun Prairie prioritize energy upgrades, including that of the library. More information on Slipstream, including resumes of key staff for this project, is included in the Reference Materials section.

Additional stakeholders are FEH Design, WPPI, and SPU, who have all indicated their support of the project through letters of support. FEH Design will be engaged to determine how the microgrid fits into the expansion and renovation plans while WPPI and SPU will be engaged to explore potential joint asset ownership models and grid optimization options. Additionally, faculty in the College of Engineering at UW-Madison, have pledged to fill a technical advisory function during the feasibility study and beyond.

In addition to these key stakeholders, the city of Sun Prairie will elicit community feedback through several stakeholder meetings already planned through the city. The first of these will be several focus groups held in September, where the city will include pointed questions about which critical services would be most helpful to residents during events of emergency. The second is an all-day event (titled a SPARK session, similar to a charette) with multiple community groups in October where comparable questions will be included. A wide swath of residents and community committees will be included in these sessions to ensure a broad demographic has been engaged. Diversity, equity, and inclusion, and sustainability committees have been confirmed to date.

[2] https://slipstreaminc.org/research/slipstream-supports-dane-county-communities-developing-energy-plans-reduce-energy

Project Resilience Objectives and Metrics

We have several stated and measurable resilience objectives that we will achieve through the development of a CRC and microgrid. During the feasibility study, we will focus on each of the following objectives as guidance towards a successful project:

- Establish the first Community Resilience Center in Sun Prairie, which can provide additional services to the community such as emergency heating and cooling, and backup power via microgrid system. Measured by the designed system's ability to provide services (kW and hours of duration), during both routine and emergency scenarios.
- Support the city in achieving its 2009 "25x25" resolution to generate 25% of electricity from renewable resources by 2025. Measured by the amount of renewable electricity generated.
- Decrease on-site peak demand (kW), which will result in lower utility bills and reduce strain on the SPU grid during times of high demand. Measured by the total expected kW reduced by solar PV and BESS.
- Support the Library board goals of establishing the library as an essential destination, honoring city commitments to DEI and under-resourced community members who may not have a suitable location to turn to during times of emergency. Measured by resident awareness and outreach - number of residents and duration served, with and without microgrid.
- Avoid alternative backup power solutions, primarily diesel generation, which would result in additional fossil fuel consumption and polluting emissions. Measured by avoided cost and emissions of diesel generator and fuel consumption to power expanded facility.
- Empower the Media Center with backup power, allowing it to provide emergency broadcasts or communications. Measured by Media Center load and capability of microgrid to support.
- Improve existing building efficiency with redesign efforts, which would allow the microgrid to power more of the facility for a longer period of time. Measured by building energy modeling or other design analysis that would characterize energy savings as opposed to building code minimums in the absence of efficiency efforts.

Evaluation of Site-specific information

The Sun Prairie Library is currently 36,000 SF, which includes 3,650 SF for the Sun Prairie Media Center and 350 SF for the Friends of the Library Read Before Book Store with current expansion plans increasing this to 55,000 SF. The planned expansion will allow the library to serve a rapidly growing population, meet Dane County minimum service standards for collection size, and increase technology stations and programming space. In a typical year, the library serves approximately 225,000 patrons.

Over the last two years, the average electricity use for the building was 40,910 kWh per month with a maximum consumption of 56,560 kWh per month. The maximum demand over the last two years was 177.6, and the average demand is 107.9 kW

The library is in good condition overall but faces challenges that necessitate the upcoming renovation/expansion. Aging HVAC/mechanical equipment, space constraints, and high use

have resulted in the Library Board approving the expansion to better serve residents. The library is centrally located in the city, and has several amenities nearby (Sheehan Park, post office, Sun Prairie community garden, aquatic center, and proximity to main street). It takes the average resident 5-15 minutes to reach the library. There are currently 140 available parking spaces, with 5 dedicated accessible parking spots, but planned expansions will expand this capacity. Currently, there is no backup power system or generator on site – if the power fails staff and patrons must clear the building. Outages do not occur frequently, on average about once annually. However, part of the intent of considering a microgrid would be to address outages and other emergencies that occur throughout the community, while ensuring power supply redundancy at the library facility.

The planned expansion for the library, with a projected cost of over $13 million, will address building maintenance upgrades including HVAC equipment, LED light fixtures and power distribution, ADA compliance, roofing, and parking lot repair. This project is being driven by several factors, including aging equipment and limited space to support collection, programming, and technology due to high population growth, demographic shifts, and changing needs and trends in 21st century public library services. By reducing energy consumption with the installation of LED lighting, a high efficiency HVAC system, new roof, solar panels, enhanced power distribution, and other facility improvements, the critical load requirement will be reduced, and will result in a less costly and properly sized BESS.

Figure 1: Layout Plan for The Sun Prairie Public Library

As no solar PV exists on the building currently, there is ample space. Maintenance or replacement of the roof is a planned component of the renovation and will focus on the layout and structural strength of the roof to ensure solar PV capacity can be maximized. There is also the potential to consider a ground-mounted system or shaded solar car parking.

City staff have communicated with SPU/WPPI Energy regarding permitting and interconnection processes and requirements for distributed energy resources/generation. Overall, both parties are prepared to complete this task. In general, for any distributed generation project an application needs to be completed and provided to WPPI. There are additional solar and energy storage supplement applications. The city would submit those materials to the utility along with a one-line diagram and insurance documentation. WPPI would then review and approve interconnection drawings. All parties would follow the procedures outlined in PSC Chapter 119 of the WI Administrative Code and the approved Distributed Generation Guidelines.

The proposed feasibility study will focus on the following additional site considerations and potential constraints:

- BESS sizing, selection, and configuration
- Critical load characteristics - HVAC for emergency heating and cooling capabilities, Lighting, Computers/Laptops, Media Center server rack, refrigeration to store medicine, plug loads
- Circuity, conduit, and programming configurations of the solar PV array, BESS, and critical loads served
- Potential grid services provision during normal operation
- Sequence of events during an outage or emergency
- Communication protocol to the public during an outage/emergency
- Parking lot utilization and potential for managed EV charging infrastructure

Technologies under consideration

The technologies under consideration are a battery energy storage (BESS) system with solar photovoltaic (PV). These technologies were selected for a multitude of reasons, including the low environmental impact, the convergence with developing plans for the library renovation, their status as proven technologies, and the low fuel and maintenance costs. The system allows for these benefits, while still providing the key functionality of being able to island to provide resiliency benefits.

Solar arrays and battery energy storage have no direct carbon or air quality impact. In comparison to the typical backup generator, this results in an emissions benefit. The central location of the library also allows these systems to serve as a demonstration project, highlighting technologies with a positive environmental impact. Unlike a backup generator, a BESS can be operated during normal grid conditions for additional benefits, resulting in faster payback. Furthermore, with no backup system currently onsite and a 100-kW solar array already approved, these two technologies also work within the bounds of the current plans and building specifications.

The primary alternative of a diesel generator would incur much higher fuel costs and would have higher maintenance requirements, which is not attractive for the utility or the city. The addition of a BESS and solar PV system presents a great learning opportunity for WPPI and the city, as it would be the first of its kind (battery storage asset) for WPPI.

Cost Match

Several parties involved in this project will provide cost share, primarily in the form of in-kind labor hours. The total cost share will represent $21,584, or 32% percent of the total cost of the feasibility study. The city of Sun Prairie will contribute 350 labor hours to this project in cost share. Additional details are outlined in the Budget Sheet. Several other partners will also provide in-kind hours to contribute to the project, namely WPPI and FEH Design Architects. All these parties' time related to collaboration on systems design and cost options will be the equivalent of cost-share hours. Additionally, Slipstream will provide 10% of its total hours as cost-share hours for the technical analysis.

This grant funding is vital to push this project forward. In the absence of grant funding, city staff simply would not have the resources or expertise to consider this option. City and utility staff are invested in the analysis of a microgrid but lack the resources and time to properly analyze the feasibility of a microgrid without this grant. The grant will provide the ability to gain a better understanding of control options, configuration options for joint control and ownership, and requisite BESS and PV size. With a technical analysis of those items completed, Sun Prairie City Council will be much more informed and able to effectively consider the financial support needed. The Library Board would also have the requisite information to make a major decision involving a high-cost addition to the existing expansion, which could be communicated in the capital campaign. Innovative solutions need collaborative support, and the feasibility study would be the foundation from which to build momentum towards securing microgrid approval.

Data Collection Plan

The data collection process will serve to collect information to aid in the financial analysis of the system, the systems sizing, and the feasibility evaluation. The process will include the compilation of previous analyses, as well as the collection of additional needed data points. The data will be collected through the utility, previous design and site evaluations, market research, and additional conversations with the design firm and SPU.

One main phase in the data collection plan will be to access and analyze energy data for the current building. SPU can provide both monthly utility bill data as well as 15-minute interval data through advanced metering. This data has been available for the past 8 months+ and is updated continuously. At least a year of previous data will be collected to provide vital information to support systems sizing analysis. This phase will build on previous analysis completed on the library's energy use during the creation of Sun Prairie's energy plan. With the planned expansion, the energy use of the library will change in the future, but this analysis will still provide a valuable baseline.

As a key piece of the feasibility study, and the other component of the data collection plan, will be to evaluate the site to understand the building systems and site constraints. There are two available documents to help with this phase: A site visit conducted by Slipstream for

the energy plan, and site evaluations completed by FEH Design. This provides helpful context, particularly around the solar PV options at the building as well as around planned upgrades that may impact current energy use. In addition to this, the timeline of the feasibility assessment will correspond with additional planning by FEH Design, allowing for additional site analysis. These plans for expansion and renovation, namely how the expansion will impact energy use, will be combined with the baseline energy use data to estimate future total energy use. This will involve analysis of the current data as well as energy modeling of the building. This information will be vital in determining appropriate size for both the solar PV system and the BESS.

The third component of the data collection plan will involve collection of data from external sources to inform the financial and system sizing analysis. This will include market and secondary research to estimate the cost of various systems, the potential output of various systems, and the associated valuations of benefits. As there is currently no on-site generation at the library, this phase will benefit from developed tools, such as PV Watts, and detailed conversations with a variety of stakeholders. This will include collecting data from SPU on the potential valuation of the grid and energy saving benefits, as well as conversations with FEH Design about the feasibility of certain systems at the building.

Systems Sizing Analysis

The systems sizing analysis will be one of the key questions answered during the feasibility study. The goal will be to gain an understanding of the size of a solar array and BESS needed to support both (1) critical loads while islanded and (2) grid support services while grid connected. The analysis will consider the feasibility of adding systems large enough to support these services, as well as analyzing the duration of outage a BESS could support. The primary focus will be on system needs to provide the resilience and reliability benefits for the community during an outage.

The critical loads under consideration will be HVAC, phone charging stations, lighting and Media Center equipment. A secondary focus will be on the potential for EV charging to take place at the library. The analysis will quantify the energy needed for these loads and will study how long previous outages have lasted. As a starting point, existing energy consumption data gives a sense of critical load energy use. The maximum monthly use in the past two years was 56,560 kWh while average usage per month was 40,909 kWh. The maximum demand over the last two years was 177.6 kW, and the average monthly demand is 107.9 kW. EIA data on electricity consumption by end-use estimates that a typical commercial building's cooling, lighting, and computers account for roughly 41% of total electricity consumption.[3] Using that 41% and the building's load, roughly 44.2 kW would need to be covered by the microgrid. During the feasibility study, a more in-depth analysis of how the expansion and renovation will impact energy consumption and the contribution of these end uses, will be conducted.

This part of the analysis is also where key considerations, such as control strategies, load management, and the ability to easily island, will be considered. The goal of the analysis will

[3] https://www.eia.gov/energyexplained/electricity/use-of-electricity.php

be to design a system that can last at least four to six hours, to cover periods while the solar panels may not be generating energy. The key factors considered while sizing the system:

- The impact of the renovation and expansion on total energy use. The expansion will increase energy use while the renovation is likely to improve efficiency of the building systems and decrease use. A more in-depth analysis will determine the net impact on energy use.
- The system will need to be designed to provide critical resiliency functions for the community. Conversations with key stakeholders, including residents and Sun Prairie EMS, will provide information on the system duration needed.
- The cost of the system will have a substantial impact on the feasibility of installation. This will be a key consideration while sizing the battery. This will consider options for joint ownership with SPU as well.

Financial Analysis

The financial analysis will involve a review of the upfront cost and financing options for interconnection of a BESS and solar PV system, as well as the valuation of the potential benefits of the installation. The analysis will include an option for Sun Prairie library ownership, as well as joint ownership by SPU and the city.

The analysis will include the upfront costs for a BESS, the cost for wiring and inverters to enable islanding, and the cost for additional solar panels. This will serve as a key component in determining the feasibility of installing a microgrid at this site. For the planned solar PV addition, the analysis will make use of the estimates done by FEH Design. Market research, including conversations with manufacturers, FEH Design, and other communities who have installed batteries, will serve as the primary way to collect additional cost assumptions for the analysis. As this will be considered a capital cost investment by the city, loan and financing options will be explored during this analysis. The option for joint operation of the asset will also consider joint financing options between the utility and the city.

The upfront costs will be compared against the potential benefits of the installation in order to calculate cost-effectiveness ratios and payback periods. This will focus primarily on the library cost savings potential and the societal benefits of resiliency that the system will bring. The secondary focus will be exploring the potential grid benefits by working with SPU to determine how the system would allow for grid optimization on normal days.

The energy cost savings will consider the solar PV system direct savings, and also how the addition of a BESS could allow for increased savings through peak load support. This will be calculated using SPU rates for energy and net metering. SPU currently offers basic TOU pricing, so the analysis will consider how the BESS could be operated to shift loads to off-peak times. We will also consider the possibility of more aggressive TOU pricing in the future and increasing energy costs over time.

This analysis will consider how the addition of backup power at the library, enabling a CRC in Sun Prairie, will provide quantifiable resiliency benefits. This will focus on the potential health benefits and the productivity benefits. These benefits will be more difficult to quantify, and the analysis will mostly rely on secondary research and assumptions around population served by the CRC to develop monetary values. The societal benefit quantification would

also quantify the monetary benefit of carbon savings, using the energy savings from additional PV and BESS and widely cited carbon prices.

The financial analysis will also consider how joint operation of the system by the SPU and the library could generate grid benefits. The potential benefits include demand response and frequency regulation. The benefits to consider here will be determined through further conversations with SPU and quantified using wholesale market data.

As a point of comparison, the financial analysis will also compare the upfront cost of the system to the cost of a diesel generator, while considering the fuel and maintenance costs of the generator.

Environmental Impact

This project directly supports the City's goal to power city operations with 25% renewable electricity sources by 2025, as well as the library's goal to be environmentally conscious during its planned expansion. Solar PV and battery energy storage were selected for this feasibility analysis, specifically due to their impact on carbon, air quality, and energy savings.

The planned addition of a solar PV system directly saves energy and carbon. Assuming a 100-kW solar system, total generation would be roughly 135,000 kWh per year (based on PV Watts calculations), which amounts to roughly 96 metric tons of CO_2 avoided. The consideration of a larger PV system and the addition of a BESS would bolster these emissions savings. Primarily, the choice of a BESS as backup rather than a diesel generator, or other fossil-fuel emitting technology, allows the library to provide vital community benefits without an adverse impact on air quality or carbon emissions. Additionally, the use of battery storage will allow for additional carbon savings for the library through increased on-site consumption of solar energy.

The feasibility study will quantify the emission and energy savings, as informed by the systems sizing analysis. The expected emissions savings will be quantified by using tools to estimate energy output of the planned solar array and EPA's emissions tools. The analysis will also consider the emissions savings from installing a BESS over a diesel generator, by estimating the emissions from a diesel generator to provide the same services.

Lastly, Sun Prairie will share its findings and lessons learned with other communities in Wisconsin. This will be achieved through sharing at the Dane County Sustainable Leaders Collaborative, as well as any other identified forums. This sharing of lessons learned will hopefully inform other communities and help facilitate more successful considerations of microgrids and CRCs across the state. Libraries across the state are community lynchpins, and this study aspires to create a roadmap in which other communities could learn relevant best practices and incorporate into their own planning and design.

Reference Materials

Slipstream Qualifications

Slipstream, a 501(c)3 organization, delivers innovative climate solutions that produce equitable economic and environmental benefits. Since 1980, our research has empowered our team to develop and test solutions on complex datasets to uncover actionable information. Our experience in architecture, engineering, economics, statistics, psychology, and communications gives us a diverse skill set to characterize energy use; conduct field research to measure building and technology performance; gather and evaluate primary data on energy use patterns; model energy use in buildings; measure appliance-specific energy use; and educate stakeholders to equitably advance energy efficiency. The following qualifications demonstrate our expertise in energy planning, load management, resiliency and microgrid technologies.

Energy Innovation Planning for Dane County Municipalities (2019-2020)
The Wisconsin Office of Energy Innovation (OEI) provided funding for seven communities in Dane County to develop energy plans. Slipstream provided project management and technical support for this year-long effort to identify and prioritize near-term actions for reducing energy and carbon in each community. Through collaboration, these seven communities (Fitchburg, Marshall, Middleton, Monona, Stoughton, Sun Prairie, and Waunakee) developed actionable recommendations that each city uses to address existing energy goals and establish additional goals. Each municipality benefits from sharing best practices and lessons learned from assessing the feasibility of innovative pilot projects and programs designed to provide maximum economic benefit to their communities. WPPI Energy, the wholesale electricity provider for several of these communities, saw this project as a model for other WPPI member communities throughout Wisconsin.

Potential for reducing energy use and carbon emissions with load shifting measures (2019-2020)
Slipstream studied the energy, energy cost, and CO_2 impacts of measures that save electricity as well as shift the time that the load occurs. Due to changing load shapes, generation mix, and other factors, utilities in Minnesota are increasingly interested in measures that shift the timing of use in addition to reducing energy. Programs exist that target this goal separately from CIPs (like demand response), but there is also overlap between CIPs and load shifting. We are quantifying the potential in that overlap.

Grid-interactive efficient buildings (2020-2021)
The Department of Energy, Building Technologies Office contracted with Slipstream to develop and demonstrate integrated controls of connected lighting, automated shades, and intelligent energy storage systems for maximum building load flexibility. The objective is to investigate the integrated systems' potential in providing grid-interactive flexible building loads and validate the performance in two real buildings.

Smart Grid Application Guide for Building Professionals (2019-2020)

In partnership with GDS, Slipstream was awarded a grant from ASHRAE to develop the industry's first version of a Smart Grid Application Guide for Building Professionals. Changes occurring in the electric grid infrastructure require new design and operation considerations for buildings and how they interact with the grid. Facilities can be operated in ways that support grid operations — economic efficiency, environmental protection and/or reliability — while potentially lowering their own costs of operation by managing loads and storage to contribute to balancing grid-wide demand and changes to the generation mix. The user's guide serves as an educational tool to inform building professionals about the smart grid and the role of buildings in it, and to provide practical information about concrete steps to prepare and operate a building in a smart grid environment.

Iowa Energy Storage Assessment (2020)
Slipstream was a subcontractor to Synapse Energy Economics, Inc. on this project that evaluated the potential benefits, as well as identified barriers, to expanding the energy storage industry and the application of energy storage in Iowa. The study was funded by the Iowa Economic Development Authority.

Energy Management Information System (EMIS) technical potential in Wisconsin (2020-2021)
Slipstream conducted this research project for Wisconsin's Focus on Energy program. Energy management information systems (EMIS) are software tools which collect, and process real-time data gathered within a building or campus to recommend, prioritize, or implement controls changes, repairs, capital improvements, or other changes to reduce energy usage, manage demand, or improve occupant comfort and productivity. Slipstream evaluated 12 EMIS products, eight service providers, and eight utility programs utilizing EMIS in North America. EMIS modeling applied to Wisconsin's stock of healthcare, office, and education buildings estimated the potential for $7.5 million in annual bill savings, 71 GWh of electric savings, and 58,000 tons of CO2 emissions reductions. Based on these results, Slipstream developed program recommendations for Focus on Energy, including a mix of new program offerings and changes to existing programs.

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P: 608.837.5500 F: 608.825.6001 W: sunprairieutilities.com

August 5, 2021

Public Service Commission of Wisconsin
Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Administrator Nieto:

Sun Prairie Utilities is pleased to provide this letter supporting the Feasibility Study for the Community Resiliency Center at the Sun Prairie Public Library.

The project application will support a stakeholder engaged process for evaluating and conducting a microgrid feasibility study. The team will study and identify potential deployment strategies for solar photovoltaics (PV), energy storage, and other microgrid technologies to bolster resilience at the Sun Prairie Public Library against power outages.

The study will also model and analyze load profiles, microgrid designs, and project costs/benefits. Sun Prairie Utilities understands the value of this project and looks forward to contributing as a strategic and technical partner of the applicant

Sincerely,

Rick R. Wicklund
Sun Prairie Utilities
Utility Manager
Cell: (414)526-9590
rwicklund@myspu.org

1425 Corporate Center Drive Sun Prairie, WI 53590-9109 608.834.4500 wppienergy.org

August 5, 2021

Public Service Commission of Wisconsin
Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Administrator Nieto:

WPPI Energy is pleased to provide this letter of support for the Feasibility Study for the Community Resiliency Center at the Sun Prairie Public Library.

The project application will support a stakeholder engaged process for evaluating and conducting a microgrid feasibility study. The team will study and identify potential deployment strategies for solar photovoltaics (PV), energy storage, and other microgrid technologies to bolster resilience at the Sun Prairie Public Library against power outages. The study will also model and analyze load profiles, microgrid designs, and project costs/benefits.

WPPI understands the value of this project and looks forward to contributing as a strategic and technical partner of the applicant.

Regards,

Jake Oelke

Jake Oelke, P.E.
Vice President – Energy Services

FEH DESIGN

August 5, 2021

Main Point of Contact:
Scott Semroc
Sustainability Coordinator
City of Sun Prairie
300 E. Main St.
Sun Prairie, WI 53590

To: Public Service Commission Office of Energy Innovation

FEH Design is providing this letter of support in regards to the City of Sun Prairie and the Public Library pursuing a grant to study the feasibility of potentially incorporating community resiliency and micro grid features into the Library expansion project.

FEH Design welcomes collaboration on this project, and the opportunity to pursue unique building design approaches and features. By conducting a feasibility study alongside the design process, this will assist in working towards the goals of the original conceptual design while incorporating questions about resiliency as the team engages with library staff, library board, stakeholders and the community at large by conducting meetings, focus groups, and spark sessions. Having this feasibility study in place will assist in creating a conceptual design that can align the library's service goals with the necessary infrastructure and architecture.

The team is willing to consider any findings of the feasibility study, coordinate on design efforts and data collection as needed, assuming a general alignment of timelines that wouldn't create significant project delays. With the majority of 2022 focused on the capital campaign, it provides a window in which the feasibility study could be completed and considered within the project design, capturing efficiencies of existing project planning.

We believe that all buildings should be environmentally responsible, and it is a primary focus for us in our designs. We strive to conserve our earth's resources for the next generation through energy-efficient buildings.

We look forward to assisting you in this project to ensure that the Community Resilience Center provides the needed services to the residents of Sun Prairie, if the project moves forward.

Sincerely,

Aaron Davis

Aaron Davis
Managing Principal

slipstream
431 Charmany Drive, Madison, WI 53719 | 800.969.9322 | slipstreaminc.org

August 5, 2021

Scott Semroc
Sustainability Coordinator
City of Sun Prairie
300 E. Main St.
Sun Prairie, WI 53590

Dear Scott Semroc,

I'm writing to confirm our intention to participate in Sun Prairie's proposed project: Feasibility Study for Community Resiliency Center at Sun Prairie Library. We are committed to supplying the specific staff, time and resources defined in the proposal as a partner on the project team.

We support the proposal's efforts to bring a Community Resiliency Center to Sun Prairie and are excited for the opportunity to collaborate with Sun Prairie and other stakeholders to study the feasibility of a battery-energy-storage system and solar photovoltaics at the library. These types of projects are vital to advancing towards a low-carbon society, and positioning Wisconsin as a leading state in emerging renewable technology.

We are also committed to providing matching funds of 10% of labor as shown in the project budget.

We look forward to assisting you in this project to ensure that the Community Resilience Center provides the needed services to the residents of Sun Prairie, if the project moves forward.

Sincerely,

Jeannette LeZaks
Director of Research and Innovation, Slipstream

300 East Main Street
Sun Prairie, WI 53590-2227
(608) 837-2511
Website: https://cityofsunprairie.com

August 4, 2021

Main Point of Contact:
Scott Semroc
Sustainability Coordinator
City of Sun Prairie
300 E. Main St.
Sun Prairie, WI 53590

To: Grantor Application Reviewer

The Sun Prairie Public Library has approved a library expansion project. The current library is over 20 years old and an architectural analysis in 2018 demonstrated a need to expand the size of the facility to support collections, programs, and services in order to meet Dane County Library standards. The current timeline for the expansion project is as follows:
2021: Conceptual Design
2022: Quiet phase: Capital Campaign
2023: Final Schematic & Construction Design. Public Phase: Capital Campaign
2024: Construction

Over the past 20 years, public library services have shifted from being collection-focused to connection-focused, meaning the public library is critical to community connection and the resources and services are much more than a warehouse of books. 21st century trends in services include cultural, educational and recreational programming opportunities for all ages, independent work and group gathering spaces, workforce development, spaces for discovery through physical and digital collections, and tools and resources for content creation.

The Covid-19 pandemic has emphasized the very critical services the library provides to our most vulnerable residents. Even when the ability to browse the library's physical collection was unavailable and when the library staff was not vaccinated, the library provided 4 hours of Express Technology Service. This service alone brought in over 77,000 visits in 2020. Residents used the library's technology for various needs such as unemployment benefits, Covid-19 test results, rental assistance, food assistance, tax filing, health insurance benefits, utility payments, immigration, and legal assistance. Some simply used the library's Express Technology Service hours for printing, photocopying, faxing, and reliable broadband connection. Ensuring a continuity of service, regardless of the square footage of the library is critical to the library's operations. Currently, during a power failure, library patrons need to exit

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the facility due safety concerns caused by a disruption in heating, cooling, and lighting. This is frustrating at best and at worst, hurts our most vulnerable residents that use our technology and spaces to meet their most basic needs.

Since the library's discussion rooms opened this spring, partner agencies such as Tenant Resource Center, Shelter from the Storm Ministries, and Project Recovery have been on site to meet with residents to assist with eviction moratoriums, rental assistance, workforce development, and Covid-19 recovery and relief. In addition, Public Health Madison Dane County has held three vaccine clinics in the library's Community Room, with additional clinics planned later this year.

Reentry, recovery, and reconnection are at the heart of our community's resiliency. As we develop a conceptual design for our expansion, we will be striving to meet goals discussed and identified by community and library stakeholders, including: 1) commitment to diversity, equity, and inclusion, 2) improvement of infrastructure for comfort, aesthetics, safety, and security, and 3) financial, environmental, and cultural sustainability. Additionally, the ability to provide a continuity of service and lifting our most vulnerable residents remains a priority for the Sun Prairie Public Library, before, during, and after the expansion project.

The opportunity to receive a grant to study the feasibility of a critical infrastructure program so that the library may serve as a community resiliency center perfectly aligns with the timeline and goals of the Sun Prairie Public Library's expansion plan. The study will enable the library to incorporate the findings into a thoughtful conceptual design, ultimately leading us to our next steps in which we can put ideas into action.

The Sun Prairie Public Library welcomes the opportunity to be a key partner in this potential feasibility study, and will tap key staff to contribute as needed in order to position the expansion project to incorporate findings of the feasibility study and educate the Library Board to consider additions to the scope that increase resiliency and the ability to provide uninterrupted services.

Sincerely,

Svetha Hetzler

Svetha Hetzler
Sun Prairie Public Library Director

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Sun Prairie, WI 53590-2227
(608) 837-2511
Website: https://cityofsunprairie.com

August 4, 2021

Main Point of Contact:
Scott Semroc
Sustainability Coordinator
City of Sun Prairie
300 E. Main St.
Sun Prairie, WI 53590

To: Grantor Application Reviewer

Community resilience is attained through many actions, not the least of which is the ability to respond quickly to an emergency event and to provide for residents' most immediate needs. In Sun Prairie and many other communities around the country, the local library system serves an underappreciated role in emergency events. Most commonly, perhaps, is the library's ability to play a role in weather emergencies, providing impromptu shelter to individuals suffering from excessive heat events during the hottest parts of the day. In this manner, the library demonstrates its own resilience accomplishing this task without interrupting its day-to-day operations. More significantly, the value that this type of service provides to marginalized community members is immense, as these groups tend to be more vulnerable to the effects of such incident and suffer at disproportionate rates.

The ability of the library to perform this important function relieves stress elsewhere in the regional emergency response system. By allowing citizens to receive the service locally, challenges such as transportation to, and the logistical operations of, a larger more centralized shelter are eliminated. Additionally, the local library has proven itself to be a valuable partner by providing a facility through which critical response and recovery phase activities can be conducted. Many non-governmental organizations use the library to connect to the community members who need housing, healthcare, long-term shelter, and more.

The library remains vulnerable in its ability to deliver this critical service because of its reliance on the existing energy supply grid. The supply grid is susceptible to failures during times of high energy demand and significant weather events; a service interruption during this type of period would be particularly afflictive. It would be to greater advantage if the library were able to implement a backup redundancy that could deliver energy during times of strain or interruption

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to the grid. In so doing, the library would continue to improve its own resilience and its ability to serve the community during times of crisis.

The Emergency Medical Services Department looks forward to potentially assisting with the feasibility study as needed, providing review and input from the perspective of community safety and emergency management.

Sincerely,

Brian Goff
EMS Chief

ANALYSIS OF ADDITION EXPANSION OPTIONS FOR

SUN PRAIRIE PUBLIC LIBRARY

FEBRUARY 2020

FEH DESIGN

TABLE OF CONTENTS

01

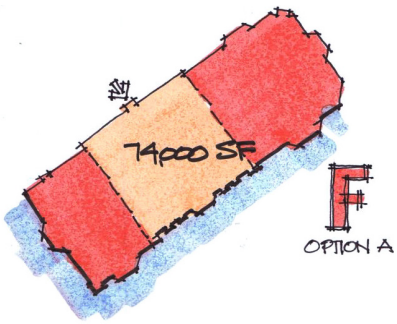
EXECUTIVE SUMMARY

ADDITIONAL LIBRARY PLANNING SCENARIOS FOR SUN PRAIRIE PUBLIC LIBRARY

FEH Design and Library Planning Associates (LPA) were commissioned to examine two additional planning scenarios for the expansion of the Sun Prairie Public Library. This effort compliments previous studies done in 2018 and 2019 that examined library space needs for the next twenty years including the possibility of branch libraries. The recommendation from those two studies is to expand the main library to 74,000 SF and add two or three branch libraries when community growth demands additional library service. This option was labeled F.4 and for the purpose of this study it will be referred to as Option A. At the direction of the Library Board and City Administration two new planning scenarios have been developed which are focused on incremental city growth and meeting Dane County library standards.

Project budgets were established for each option based on 2020 construction costs. They include building construction and renovation, site improvements, and other project cost for professional fees, fixtures, furnishings and equipment, and campaign facilitation for selected options. They do not account for operational costs, collection acquisitions, and future staffing.

Here is a summary of all three planning scenarios:



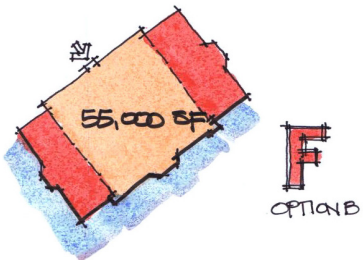
OPTION A.

This is the optimum solution that expands the main library from 36,000 SF to 74,000 SF. This option will support 45,580 people in the City of Sun Prairie in the year 2040 AND meet the Dane County minimum standard for services for County reimbursement. This option will support a collection inventory of 175,000 items with further collection growth (to 250,000 volumes) captured in 2-3 branch facilities. This option supports an increased number of technology stations, reader seating, increased staff work stations, the optimum array of public meeting rooms (200 seat multi-purpose room, 120 seat multi-purpose room, 14 person conference room, and 65 seat story time room), special use space for small group studies, copy center, expanded book store, and a discovery zone in the children's department. Building maintenance upgrades including; HVAC equipment, light fixture and power distribution, ADA compliance, roofing, and parking lot repair are included in this option.

Total project cost $18,826,000.

OPTION B.

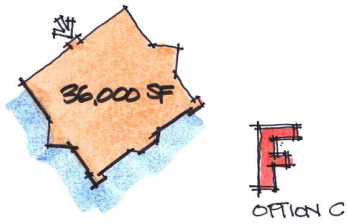
This option is a mid-level solution that expands the main library from 36,000 SF to 55,000 SF. This option will support 43,000 people in the City of Sun Prairie in the year 2035 AND meet the Dane County minimum standard for service for County reimbursement. This option will support a collection inventory of 146,200 items as well as additional technology stations, reader seats, and story time room. Building maintenance upgrades including; HVAC equipment, light fixture and power distribution, ADA compliance, roofing, and parking lot repair are included in this option. Since a full building program has not been developed this option represents one possible scenario.



Total project cost $13,067,000.

OPTION C.

This option is a rehabilitation solution at the main library that focusses on replacing existing building systems including; HVAC equipment, light fixtures and power distribution, ADA compliance, roofing, and parking lot repairs. There is no building expansion of the 36,000 SF main library and no change in the resource and service inventory from present-day levels. Some library furnishings will be upgraded to include power and shelving heights for the print collection will be lowered. This option will support 36,000 people in the City of Sun Prairie until the year 2025 AND meet the Dane County minimum standard for service for County reimbursement.



Total project cost $3,554,000.

02

PLAN SCENARIO ANALYSIS

SUN PRAIRIE PUBLIC LIBRARY
SERVICE + SPACE NEEDS SCENARIO SUMMARY

RESOURCE + SERVICE SUMMARY

	Option A	Option B	Option C
City population	45,580	43,000	34,926
Year	2040	2035	2019
Collections			
Print + media	175,000	146,200	134,186
Magazines	140	140	215
Technology stations	50	42	32
Reader seating	120	120	122
Staff work stations	54	42	25
Meetings + programs			
Multi-purpose 1	200	120	120
Multi-purpose 2	120	0	
Conference room	14	14	14
Children's storytime	65	65	30

SPACE NEED SUMMARY

	Option A	Option B	Option C
Collections	17,640	14,760	
Technology stations	2,000	1,680	
Reader seating	3,900	3,900	
Staff work stations	7,425	5,775	
Meeting + programs	4,995	2,945	
Special use space (1)	10,083	6,317	
Nonassignable space (2)	20,164	15,162	
Percent for art (3)	1,008	0	
Dedicated allowances (4)	5,900	4,900	3,199
GROSS AREA	*73,115*	*55,439*	*36,000*

NOTES:

(1) Special use allocation supports small group study rooms, copy center, possibly a refreshment area, etc.
(2) Nonassignable allowance supports mechanical rooms, restrooms, stairways, elevators, etc.
(3) Option A includes allocation to reserve public art installation(s).
(4) Dedicated allowances includes space for functions including the Sun Prairie Media Center, Friends bookstore, a discovery zone in the children's department, 24/7 delivery lockers, and other features.

Concept F.4 Option B - Opinion of Probable Cost

	DESCRIPTION	QTY	UNIT	COST/SF	TOTALS
Building Construction Costs:					
	New construction				
1	New Addition: 55,000 SF - 34,717 SF = 39,283 SF	20,283	SF	223.00	4,523,109
2	Renovation of existing Library building: replace HVAC equipment	34,717	SF	11.90	413,132
3	Renovation of existing Library Building: replace existing with LED light fixtures	34,717	SF	15.00	520,755
4	Renovation of existing Library Building: power distribution for furniture	34,717	SF	2.50	86,793
5	Renovation of existing Library Building: ADA Compliance, staff restrooms, doors, from May 2018 report	1	LS	119,450.00	119,450
6	Renovation of existing Library building: membrane roof replacement and flashing	19,800	SF	7.25	143,550
7	Renovation of existing Library building: remove and replace carpet at collections	20,000	SF	4.50	90,000
8	Renovation of existing Library building: replace some ceilings resulting from lightir	10,000	SF	7.00	70,000
9	Renovation of existing Library building while occupied in a phased manor:	34,717	SF	2.00	69,434
10	May 2018 condition assessment items excluding those listed above	1	LS	174,640.00	174,640
				SubTotal	6,210,863
				Design / Bid Contingency 10%	621,086
				Building Construction Costs SubTotal	6,831,949
				Construction Contingency 5%	341,597
				BUILDING CONSTRUCTION COST TOTAL	**$7,173,547**
Site Work Construction Costs					
11	Structure Deconstruction - porch	1,250	SF	7	8,750
12	Relocate trees	22	EA	750	16,500
13	Remove foundations - porch	1,250	SF	1	1,250
14	Hazard Material survey, sample, test	0	LS	7500	0
15	Hazardous material abatement	0	SF	6	0
16	New Parking Spaces & Drive Lane	46,900	SF	9.00	422,100
17	Renovation of existing Library parking lot: resurface lot w/ thermo plastic overlay	9,903	SY	6.00	59,418
17.5	Renovation of existing Library parking lot: repave w/ 1" asphalt wear course overl	9,903	SY	8.20	81,205
18	Concrete Curb and Gutter	2,060	LF	12.00	24,720
19	Children's Outdoor Program area	1,000	SF	8.00	8,000
21	Storm Sewer	360	LF	32	11,520
22	Domestic Water	360	LF	26	9,360
23	Sanitary Sewer	360	LF	38	13,680
24	Electrical service, transformer	1	LS	24,000	24,000
25	Relocate power lines & poles	0	LS	20,000	0
26	Fill material	0	CY	27	0
27	Retaining Walls	0	LF	120	0
28	Pedestrian Paving,	5,550	SF	2.00	11,100
29	Renovation of existing Library parking lot: remove gravel and add soil	10,125	SF	3.60	36,450
30	Renovation of existing Library parling lot: landscape the islands	10,125	SF	14.00	141,750
31	Roof canopy	1,400	LS	30	42,000
32	Flag pole	0	LS	2,800	0
33	Directional & Informational Signage - signage, electronic site sign and building	1	LS	24,000	24,000
34	Storm Water Detention - underground	0	SF	12.00	0
35	Parking lot lighting	8	EA	1,900	15,200
36	Solar Panels - 100 KW	100	KW	1,730	173,000
				SubTotal	1,124,003
				Design / Bid Contingency 10%	112,400
				Site Work Construction Costs SubTotal	1,236,403
				Construction Contingency 5%	61,820
				SITE WORK CONSTRUCTION COST TOTAL	**$1,298,223**
37	Land Acquisition	1	LS		0
38	Legal Fees	1	LS		10,000
39	Architectural & Engineering Design Fees	1	LS		741,280
40	Information & Technology Design Fees	1	LS		25,588
41	Furnishing Design, selection, bidding Fees	1	LS		240,560
41.1	Owners Rep Fee	1	LS		423,588
42	Geo Thermal Horizontal Test Well	1	LS		12,000
43	Site Survey (utilize existing facility documents)	1	LS		6,500
44	Printing Costs for Construction Documents	1	LS		8,500
45	Construction documents review Fees	1	LS		10,000
46	Builders Risk Insurance	1	LS		7,000
47	Quality Control Material Testing & Inspections	1	LS		30,000
48	Construction Utility by Owner	1	LS		10,000
49	Fixtures, Furnishings & Equipment Allowance $24/SF new	53,308	SF	24.00	1,279,392
49.5	Fixtures, Furnishings & Equipment Allowance $16/SF existing	35,692	SF	16.00	571,072
50	Technology & Computer Equipment Allowance	53,308	LS	6.00	319,848
51	Energy & Utility Rebates	1	LS		(15,000)
52	Geotechnical subsurface investigation	1	LS		7,500
53	Moving	1	LS		12,000
54	Ground breaking and dedidcation ceremonies	1	LS		3,000
55	LEED certification services	1	LS		0
56	Library Programming	1	LS		30,000
57	Commissioning	1	LS		0
58	Reimbursable expenses	1	LS		18,000
59	Referendum Campaign Facilitation	1	LS		30,000
60	Fundraising Consultanting & grant writing	1	LS		75,000
				Soft Cost SubTotal	3,855,828
				Site Work Construction Cost Total	1,298,223
				Building Construction Cost Total	7,173,547
				PROJECT TOTAL COST	**$12,327,598**
	Inflation 3% per year				$13,067,253.89

03

FAST FACTS SUMMARY

CONCEPT F - OPTION A

Main Library size 74,000 GSF, supports a City population of 45,580, Collection size 175,000 volumes, total project cost $18,826,000.

Pros

- Meets Dane County minimum standards through 2040
- Most cost-effective solution to meet the year 2040 service needs of the community; least total cost to build the optimum using current-day dollars
- Project costs are offset by private fundraising campaign
- Optimizes use of the current site by anticipating any additional future service needs above and beyond this scenario will be met with the introduction of branches

Cons

- Construction is likely delayed until 2024
- Cost escalation will increase project cost if delayed until 2024
- Until that time it will be difficult for the library to maintain compliance with the County standards

CONCEPT F - OPTION B

Main Library size 55,000 GSF, supports a City population of 43,000, in the year 2035 Collection size 146,200 volumes, total project cost $13,067,000.

Pros

- Meets Dane County minimum standards as long as the city population does not exceed 43,000
- Is a cost-effective solution until the city population passes 43,000
- Project costs are offset by private fundraising campaign
- Construction likely to begin in 2022
- Project costs offset by private fundraising campaign, but less than in Option A.

Cons

- In the mid-term, Option B will require an addition of some 18,000 square feet to support the year 2040 service needs of the community
- Construction of that addition will incur escalated future-dollar costs
- Alternately, if an expansion at the present site is not pursued, the library will need to introduce branches at an earlier date and those branches will need to be larger than anticipated in Option A

CONCEPT F - OPTION C.

Main Library size 36,000 GSF, supports a City population of 36,000, Collection size 134,186 volumes, total project cost $3,554,000

Pros

- Cheapest solution
- Meets Dane County minimum standards today
- Construction can begin in 2021

Cons

- **WILL NOT MEET DANE COUNTY STANDARDS BEYOND THE YEAR 2025**
- Defers briefly the needed expansion; the city population soon grows to a point where the requirements of the Dane County standards cannot be met within the library's current footprint
- Not able to aeffectively maintain accessibility and inclusive service goals, particularly for patrons with mobility issues.
- Anticipates no offset of project costs by private fundraising; it is unlikely that Option C can attract avid support from potential sponsors and donors
- Likely accelerates the timetable to introduce branches (depending on the scale of the expansion the city eventually settles on)

SUN PRAIRIE GROWTH PROJECTIONS

These numbers are based on reports put together by the Wisconsin Department of Administration in the year 2013. Updated projections are likely to be higher than what is listed.

POPULATION ESTIMATES, WISCONSIN DEPARTMENT OF ADMINISTRATION (2013)	
2013	30,398
2014	31,213
2015	31,810
2016	32,613
2017	32,933

POPULATION PROJECTIONS, WISCONSIN DEPARTMENT OF ADMINISTRATION (2013)	
2019	34,926
2025	37,880
2030	40,948
2035	43,330
2040	45,580

Dane County is predicted to add almost 119,000 people over 30 years
Dane County is expected to experience the highest numeric growth in the state through 2040

04

APPENDIX

The following pages include the assessment of space needs provided by Anders Dahlgren.

SUN PRAIRIE PUBLIC LIBRARY / SPACE NEEDS ESTIMATE
2020 SCENARIO STUDY
OPTION B / "MIDDLE GROUND"

			Units	SPACE ALLOCATION			
A. Collection space				Optimal	Moderate	Low	*Recommend*
Print + media (NOTE: 0% in circulation)							
Opt:	@	10.0 vol / sq.ft.	146,200	14,620			*14,620*
Mod:	@	11.5 vol / sq.ft.	146,200		12,713		
Low:	@	13.0 vol / sq.ft.	146,200			11,246	
Periodical display							
	@	1.0 titles per sq.ft.	140	140	140	140	*140*
B. Public network stations							
Opt:	@	50.0 sq.ft. / terminal	42	2,100			
Mod:	@	40.0 sq.ft. / terminal	42		1,680		*1,680*
Low:	@	35.0 sq.ft. / terminal	42			1,470	
C. Reader seating space							
Opt:	@	35.0 sq.ft. / seat	120	4,200			
Mod:	@	32.5 sq.ft. / seat	120		3,900		*3,900*
Low:	@	30.0 sq.ft. / seat	120			3,600	
D. Staff work space							
Opt:	@	150.0 sq.ft. / station	42	6,300			
Mod:	@	137.5 sq.ft. / station	42		5,775		*5,775*
Low:	@	125.0 sq.ft. / station	42			5,250	
E. Meeting room space							
Multi-purpose room 1							
	@	10.0 sq.ft. per seat + speakers area	120	1,400	1,400	1,400	*1,400*
Multi-purpose room 2							
	@	10.0 sq.ft. per seat + presenter	0	0	0	0	*0*
Board / conference room							
	@	30.0 sq.ft. per seat + 10 gallery	14	520	520	520	*520*
Children's multi-purpose room							
	@	15.0 sq.ft. per seat + presenter	65	1,025	1,025	1,025	*1,025*
SUBTOTAL (A+B+C+D+E)				30,305	27,153	24,651	29,060
F. Special use space (calculated against SUBTOTAL)				Optimal	Moderate	Low	*Recommend*
Opt:	@	17.5% of gross building area		10,607			
Mod:	@	15.0% of gross building area			7,405		
Low:	@	12.5% of gross building area				5,136	*6,317*
G. Nonassignable space (calculated against SUBTOTAL)							
Opt:	@	32.5% of gross building area		19,698			
Mod:	@	30.0% of gross building area			14,811		*15,162*
Low:	@	27.5% of gross building area				11,298	
H. Percent for art allowance (calculated against SUBTOTAL)							
Opt:	@	0.00% of gross building area		0			
Mod:	@	0.00% of gross building area			0		
Low:	@	0.00% of gross building area				0	
I. Dedicated allowances							
Sun Prairie Media Center (current space)				3,500	3,500	3,500	*3,500*
Bookstore + sorting				500	500	500	*500*
Children's discovery zone				500	500	500	*500*
Delivery lockers / dispenser device?				250	250	250	*250*
Historical museum display				150	150	150	*150*
Garage for library vehicle				0	0	0	*0*

FACILITY CONDITION ASSESSMENT NARRATIVE - DRAFT
SUN PRAIRIE PUBLIC LIBRARY
MAY 2018

ARCHITECTURAL ASSESSMENT

The 1998 Sun Prairie Public Library is one story, slab on grade 35,692 GSF building comprised of metal stud framing with masonry veneer in brick, stone, and limestone. Continuous gable roof forms intersect to create an open, vaulted interior aesthetic with low-slope roof quadrants to house mechanical equipment. Porches are location on the west and east ends of the building. A portion of the building northeast corner is occupied by the Sun Prairie Media Center; this is an acoustically separated space.

The Sun Prairie Public Library is in reasonably good shape but will require work to update accessibility, resolve some issues, and address maintenance due to end of life-expectancy on systems & equipment. The following is a report of the condition of the current building along with estimated costs for corrections needed.

EXTERIOR

The exterior of the building is primarily constructed of brick, stone, limestone veneers. The main entrance is on-grade centered on the south façade. Entrances on the west and east are provided for staff and the media center, respectively.

The mix of materials on the exterior create a complex aesthetic but there is little visible evidence of differential movement. There is some discoloration on the stone and mortar, which is mostly due to weathering and natural dirt build up. Cleaning the stones with as mild a solution as possible is a good way to both keep them looking good, but also to keep them safe from deteriorating due to oil and dirt residue. There are minimal instances of rust visible at masonry cracks; this

should be repaired. There are a few instances around the chimney where mortar is missing or deteriorated; this should be repointed.

The current concrete sidewalks around the building and parking lot to the north are suffering some chipping and cracking, which can become a tripping hazards for occupants. As these elements move and settle they will cause increasing problems for occupants trying to safely enter and exit the building. These should be monitored and corrected to maintain safety.

Sealant around windows and doors is cracking and contracting. It is at the end of its expected life and should be replaced at all exterior locations. There are some locations of pipe penetrations that are not sealed at the exterior, allowing entrance to pests and moisture; these should be sealed.

The porches provided on the west and east sides of the building have cedar siding and a cedar-trimmed fascia. This has weathered and has started cupping, with nails sticking out. The boards should be re-fastened and replaced if necessary. The stain finish has also deteriorated due to exterior exposure and should be reapplied. If these porches were to be occupied year-round, new siding material should be provided, they would require little structural modification, and should be evaluated for egress and code compliance.

The existing roof is a mix of forms and materials. The gables are asphalt shingles, cement tile roofing, copper standing seam roofing, with copper flashing and stone copings. The low slope roof quadrants that house mechanical equipment are covered with black EPDM roof membrane. The gable roofing portions are weathering well, but the roof membrane is nearing the end of its life expectancy. The sealant seams are contracting and in need of replacement. There are some punctures in the membrane that could allow water infiltration; these should be sealed. Exposed roof termination bars should be re-sealed. The walkway pavers are deteriorating and spalling, which is interrupting the water path to the roof drains and allowing water to pond. It is expected that fixes will help maintain the roof for a few

more years whereupon it should be replaced. A non-ballasted system is recommended with a light-colored membrane with a long warranty.

INTERIOR

The existing library interior is in good condition. Lack of space appears to be a primary issue, but there are few condition items that require attention.

There is evidence of water infiltration in the main entrance vestibule. The acoustical fabric in the gable is stained and becoming unglued. There are instances around the building where the fabric in the gables is loose and bubbling. This should be evaluated in closer detail to verify the substrate is sound and the fabric re-adhered.

Door hardware now requires free egress, so when an occupant exits a space, the person does not need to make more than one motion to exit or unlock a door to exit a space. The existing door exit hardware does not provide proper egress at the media center main doors.

ADA

Providing universal access to public spaces is required by the Americans with Disabilities Act (ADA). This law sets guidelines for clearances, reach ranges, and the extent that an object can project into the path of travel, among other requirements.

In libraries, the minimum space between shelving units is 36" clearance with a 5-foot circle or t-shaped turning space at the end of the aisle. 42-inches is the recommended clearance. There are locations where the stacks are arranged with book spinners in the main aisle, providing less turning clearance than what is required.

All publicly accessed water fountains are required to be installed in pairs at two mounting heights to allow for occupants of different reach ranges to use them. The current drinking fountains at the main entrance and the children's area are in pairs, but they are mounted in the path of egress travel, protruding too far from the face of the wall into the corridor. The drinking fountain in the Media Center is not accessible.

Generally, all doors in use by the public must have 1'-0" of clearance beside the door on the push side and 1'-6" on the pull side. There are instances of insufficient clearances adjacent to doors, specifically in the bathrooms and the door exiting the staff area. Proper clear space is also required where walls are greater than 8-inches thick. The exterior walls and acoustically-rated walls have door frames that are justified to the exterior plane of the wall, resulting in insufficient clearances at doors in the community room, the exterior, and the back entrance to the media center.

None of the six toilet rooms are fully accessible. Accessibility is not only the large toilet stall, but also includes the door clearances, grab bar locations, clear space in front of the sink, maneuvering spaces, and toilet accessories. The public bathrooms do not have the proper door clearances, insufficient space is provided between the stalls and the edge of the vanity, are missing a grab bar installed vertically above the 42" bar on the wall parallel to the toilet. The toilet paper dispenser protrudes too far into the accessible stall clear area. The staff toilet rooms are not required to be accessible since they are not open to the public. But, they do not have sufficient space around the toilet. The media center toilet room and youth toilet room are too small, without the proper clear space, improper grab bar sizes, and toilet accessories mounted too high. Shrouds are also required at piping below the sink.

The interior, automated book drop does not have the proper 30-inch by 48-inch accessible clearance in front of the drop for a person in a wheelchair.

Signage is not provided in all areas and must be accessible, with raised characters and braille.

The AED cabinet protrudes into the path of travel in a manner that presents a hazard. It should protrude no more than 4-inches or have detection below the cabinet.

The exterior curb ramps are required to have flared sides with a maximum slope of 1:10 and a 3-foot landing at the top of the ramp. These requirements are not met in the current configuration.

It was requested that FEH provide reasonable recommendations beyond the baseline guidelines of the ADA. Primary areas of expanded focus are entrances/doors, bathrooms, and paths of travel. Accessible design in this instance would include 48-inch wide doors or double doors opened by a single door operator. Five-foot aisles and common paths of travel would be recommended with a 6-foot turning radius. Bathrooms would include the enlarged turning radius with extra wall reinforcement at grab bars and floor-mounted toilet fixtures.

STRUCTURAL

The building is steel framed with exterior metal stud framing and with masonry veneer. Decorative wood trusses are exposed in the primary open gable at the entrance. The community room is designed with reinforced masonry walls and designated as a tornado shelter. Structurally, there is little evidence of settling or movement at the exterior. The building was designed to expand vertically and support a second floor with library floor loading, a 150 psf live load, which is consistent with the current code. Two knock-out panels were provided in the floor slab for future elevator hoistways. The elevator hoistway pits are indicated on the construction drawings to be 4'-0" deep, which is less than the current code-specified depth of 5'-0". If vertical expansion of the library were to be considered, current code requirements may necessitate lateral load support modifications to the first floor of the library. The second-floor exterior wall construction would be limited to metal stud and masonry veneer.

ENGINEERING SUMMARY

The purpose of this study is to investigate and evaluate the existing plumbing, fire, mechanical, and electrical systems for the existing library facility. The evaluation is to make general assessments of the condition of the systems, identify code related items, and establish equipment useful life and expectations. This also provides recommended strategies on the systems for operation and service. This evaluation shows that a good portion of the library's infrastructure in plumbing, mechanical and electrical systems are in reasonably good condition. Maintaining the existing equipment in the coming years is important with regular on-going maintenance.

PLUMBING SYSTEM

WATER HEATER

Domestic hot water is supplied from a 50 gallon, gas high efficiency storage type water heater, located in the mechanical room. The installed water heater (01/09/2008) appeared to be in excellent condition. The original water heater only lasted 10 years from 1998-2008, which would point to a water quality issue.

NATURAL GAS

Natural gas piping is steel welded and threaded with fittings which serves the rooftop units, boilers and water heater. The gas meter is located on the north side of the building. There are no known issues with this system. The rooftop gas piping should be painted to minimize the rusting and deterioration.

DOMESTIC WATER

Domestic water piping systems are copper with sweat fittings. Domestic hot water and cold water are insulated with fiberglass insulation. The hot water system has a hot water recirculation line. These piping systems appear to be in good condition; however visual observations do not reveal potential internal issues. It is unknown if there are issues with this piping system, although the calcium deposits present at the chemical feed system could be indicative of hard water. A water softener is installed on the system. The softener has a 15-year life expectancy and now is on its 20th year of service.

SANITARY

Sanitary waste and vent piping is a mixture of PVC and cast iron, with the majority being PVC. The sanitary system should be inspected with camera to determine the condition of the interior of the piping system and to determine if any remedial action would be required.

STORM

Storm drainage is accomplished by perimeter gutters and downspouts away from the building. These all appear to be in good condition. Some settling on the exterior concrete walkways has occurred and can be addressed during future work. There are internal roof drains. Piping on this system could not be verified.

PLUMBING FIXTURES

Plumbing fixtures are vitreous china (bathroom fixtures) or stainless steel (sinks, water fountains) and appear to be in good condition. Accessible fixtures are available. Water coolers are past their useful life. The dual water cooler in the children's area does not stop running. Wall hydrants, floor drains and clean outs are in good condition from visual inspection. The mop sinks appear to have water damage around the surrounding walls. These walls need protection from water intrusion. Water fountains and mop sinks should be replaced.

FIRE PROTECTION SYSTEM

FIRE SERVICE/SPRINKLER

This building is sprinkled for the fire suppression system. The system is a dry type system with an operational compressor, concealed heads and exposed pendant heads. There have been issues with the system due to freezing or below-freezing conditions in the porch areas. The building does have the fire alarm and detection system, which is addressed in the electrical narrative. NFPA 25 does require that a number of heads be replaced every 20-25 years. That number could be as high as 2 percent. The cost of this maintenance item and possible fixes for other issues should be considered as part of any remodel. The fire system is monitored at its entrance in the mechanical room. Certifications are current.

HVAC SYSTEMS

AIR DISTRIBUTION SYSTEM

The air distribution system to the spaces is served with fourteen commercial rooftop units by Trane which provide the cooling and heating to library as well as the support spaces. These are forced air unit systems to temper the air. Furnace output has an AFUE 80% efficiency unit. The heating mode has no modulation. The building system is a variable air volume supply (VAV) air to the space. The return air is a ducted return system. Life expectancy of rooftop units is 15-20 years depending on service, maintenance and changing filters. These rooftop units were installed 1998. Annual service checkups are recommended. The existing exhaust fans should be regularly inspected, fan belt checked, cleanliness and tested for system operation expectancy. It is recommended the supply and return air ducts be cleaned as an indoor air quality improvement measure. The outside air cannot be measured or assured due to the lack of economizer fans on the system. Addressing indoor air quality can be assured in a new design, if applicable.

The rooftop units can be replaced with curb adapters to a higher efficiency type unit with the necessary controls to bring them up to present-day code. Another option is to reduce the number of units to take advantage of the diversity in the system. Additional equipment added to the system can bring the building up to current code compliance.

VAV UNITS

The VAV units are original. The life of these units can extend to 30 years. Coil cleaning is recommended. Each unit should be assessed at the time of remodel or expansion, if applicable.

BOILERS

The three (3) boilers are original to the 1998 building and are at the end of their expected life. The boilers serve finned radiation, unit heaters, cabinet unit heaters, and VAV boxes. Boiler pumps are installed at the ceiling joist and are not serviceable. The boiler pumps should be moved to a serviceable location. The chemical feed system is rusted shut and has not been utilized in some time. A water quality test should be done to assess the need for treatment.

CONTROLS (DDC)

The main control panel has been replaced. The new panel is serving the existing equipment. Parts for the existing Direct Digital Control (DDC) system still in use will be hard to purchase as the system ages. The original control panel was abandoned in place and should be removed. Economizer and humidity control need to be added to the system and the equipment to guarantee air quality throughout the building.

RECOMMENDATIONS:

A replacement strategy should be used for DDC, VAV, boiler, finned radiation and other mechanical equipment as they are near the end of service. Finned radiation is controlled separately on standalone style thermostats. The radiation units were running at the time of inspection with the control system not

responding. There is no humidity control or outdoor air control in the space. An overall new design should be implemented to address the code compliance of the building in response to new energy and air quality requirements.

ELECTRICAL SYSTEMS

SERVICE ENTRANCE

A 1200A – 208y/120V, 3 phase, 4 wire service is provided underground to the building from Sun Prairie Utility by way of a pad mount transformer on the west side of the building. The transformer is located in a screening enclosure near the dumpsters. The utility meter is mounted to the side of the transformer. All components related to the service entrance are in good condition. The power reliability in Sun Prairie is said to be very good with minimal outages. When occurring, they are very brief.

Grounding System

Grounding electrode conductor is present and the building water main. No other grounding electrodes were visible or reviewed. It is assumed that all branch circuit raceway contain an equipment grounding conductor.

DISTRIBUTION EQUIPMENT

The Siemens Type SB style circuit breaker switchboard is located in a common mechanical room on the west side of the building. The switchboard is original to the building (19 years old) and good condition. There is limited physical space to expand the switchboard or provide additional breakers. The switchboard has 2 sets of meters. Analog current and voltage meters are built into the main breaker section of the switchboard along with a digital EMON DMON kilowatt-hour meter attached to the distribution section. All meters appeared to be in working condition. At some point a few of the breakers looked to have been taped off for maintenance. When the tape was removed, it removed the breaker label. A surge protective device is not installed on the service entrance equipment.

Life expectancy for molded case circuit breakers in the industry is generally expected to be about 30 years, given favorable environment and regular maintenance. Required maintenance, especially for older breakers, includes annual exercising—OFF, ON, TRIP, RESET, ON. This will help to ensure that the mechanism remains operable. Conditions of service, including number of on-off cycles, number of load operations, overloads, short circuits, environmental conditions, and maintenance may affect the time of useful service.

Given the switchboard's good condition it seems reasonable to expect, under normal operating conditions, it will continue to serve the building reliably for an additional 10 years. Future expansion projects will need to consider the physical expansion limitations along with the increased demand.

RECOMMENDATIONS:
Exercise breakers per manufacturer's recommendations. If not already done annually, thermally scan bus and cable connections or consider de-energizing the switchboard for a brief period to allow the mechanical connections to be retorqued to ensure no loose connections exist which can lead to arcing and premature equipment failure.

BRANCH PANELBOARDS
Siemens Type S1/S2 branch circuit panelboards are located throughout the library to serve local branch circuit loads. All panels are original (19 years old) and good condition. Except for panel AR/AL, there are very few spare breakers or bus provisions available in the branch panels. All panels appeared to have updated directories. Based upon the branch circuit panels supplying primarily receptacles and lighting, there are no overloading concerns. As future lighting upgrades are made with possibly conversion to LED, the lighting power will be reduced, creating opportunities for additional receptacle load if necessary.

Life expectancy for molded case circuit breakers in the industry is generally expected to be about 30 years, given favorable environment and regular maintenance. Required maintenance, especially for older breakers, includes annual exercising—OFF, ON, TRIP, RESET, ON. This will help to ensure that the mechanism remains operable. Conditions of service, including number of on-off cycles, number of load operations, overloads, short circuits, environmental conditions, and maintenance may affect the time of useful service.

Given the panelboard's good condition it seems reasonable to expect, under normal operating conditions, it will continue to serve the building reliably for an additional 10 years. Future expansion projects will need to consider the physical expansion limitations along with the increased demand.

RECOMMENDATIONS
Exercise breakers per manufacturer's recommendations. If not already done annually, thermally scan bus and cable connections or consider de-energizing the panelboards for a brief period to allow the mechanical connections to be retorqued to ensure no loose connections exist which can lead to arcing and premature equipment failure.

MOTOR STARTERS / DISCONNECTS
Siemens equipment and is original (19 years old) to the building. All equipment appeared in good condition.

EXTERIOR LIGHTING SYSTEM
The lighting system consists primarily of metal halide lamps with a few LED ground mounted flood lights. All building-mounted and pole-mounted lights are in very good condition considering they are original to the building. Other than some paint fading from UV exposure, the pole mounted fixtures have held up extremely well to the weather and sidewalk salt.

At some point the ground-mounted floods on the south side of the building were replaced with LED. They are in good condition.

The cluster of flags on the site, which include the US Flag, are illuminated.

INTERIOR LIGHTING SYSTEM

The lighting system consists of 3 primary concepts within the stacks, public circulation and back of house. Luminaires utilize a variety of lamps from compact fluorescent, linear T8 and retrofit LED. It was noted that the linear T8 standard is now to use 5000K. The facility is currently working towards retrofitting existing sources to LED where it can easily be done. Upgrading the linear T8 to LED is currently not being considered. All of the luminaires were found to be in good working condition.

Stacks – Suspended direct/indirect fluorescent with T8 lamps. Fixtures are in good condition. Illumination levels within the stacks is appropriate and consistent with current illumination standards. Lamp color temperature (CCT) is varied unintendedly and very noticeable against the ceiling. It is likely the case of those replacing the lamps being unaware of the differences associated with CCT values. [Photo Right]

Public Circulation – A mixture of suspended direct/indirect bowl style pendants, decorative wall sconces and a custom catenary style vessel to indirectly illuminate the exposed beam structure. The layered lighting approach and decorative fixture seems to meet the spaces needs along the entry axis corridor which extends from the front door to the fire place. The suspended bowls in spaces perpendicular to the entry axis appear dated and do not provide sufficient illumination. These areas include the reference seating carrels and the children's area. These particular areas are also a concern of the library staff. [Photos Right]

Back of House – Recessed and Suspended T8 luminaires with local controls

Community Meeting Room – A mixture of suspended direct/indirect bowl style pendants, decorative wall sconces and recessed downlights. The room could be adequately illuminated for meeting functions with multiple zones of control to support AV functions.

Media Center – In addition to the back of house type lighting in the corridors and offices, there is a theatrical lighting system within the production rooms which utilizes the ETC Unison dimming racks. All components appeared to be in good condition. Date of installation unknown.

EMERGENCY LIGHTING & EXIT SIGNS

The emergency egress lighting system utilizes standalone battery packs which appear to be original to the building. Battery life on these types of products is 3-5 years. The units should be tested monthly with a 30-second test and annually with a 90-minute test. It was not possible to determine if the emergency units installed have self-test feature of if facility staff was performing the maintenance tests. Coverage of the units was infrequent but assumed to meet the code minimum requirements.

Exit signs utilize standalone internal batteries. The signs appeared to be original to the building. Battery life on these types of products is 3-5 years. The units should be tested monthly with a 30-second test and annually with a 90-minute test. It was not possible to determine if the emergency units installed have self-test feature of if facility staff was performing the maintenance tests. Coverage of the exit signage was adequate.

WIRING DEVICES

All receptacles, light switches and similar devices were found to be in good condition with no obvious signs of failure or excessive wear. Devices mounted near sinks and located outside are GFCI type. Floorboxes within the stacks area have held up well and remain in good condition. It was noted that a few of the covers have required replacement.

LIGHTING CONTROL SYSTEM

A Hubbell CX relay-based control panel was installed in the spring of 2017 as a replacement for the original control system, which used lighting contactors with timed control from the original Trane system. The new panel is astronomical-time-based with dedicated sequences which are not interfaced with the Trane temperature controls system. The panel controls public area interior lighting and exterior lighting. It is in new condition as is said to be working very well. There are 2 spare relays for future loads.

Staff and back of house areas utilize occupancy sensors. No daylight sensors were found. Many spaces have adequate natural light. Additional daylight responsive controls would provide some energy savings.

Fire Alarm

The main control panel is a FireLIte Alarms MS-9200UDLS addressable control panel which does not appear to be original to the buildings. The date of installation was not available at the time of the survey. All systems are shown as normal on the display with no trouble conditions. The time on the control panel was not correct and was a few hours behind. The remote annunciator is located in the main entry vestibule. Notification devices are horn-strobe type and located to provide adequate coverage throughout the library. Pull stations are located at building exits. The system is integrated with the dry pipe sprinkler system. There are a series of what looks to be legacy smoke detectors installed throughout the stack areas. It was difficult to tell if these were in operation or even associated with the fire alarm system.

CONCLUSION

As noted in the assessment, generally, the library is in good shape. There are some items throughout the building that require attention. There are also items that are reaching the end of their life expectancy and the library should plan to budget to replace items as needed.

LOOKING TO THE FUTURE

As designs and expectations are reviewed related to the existing library, there are some considerations to keep in mind. Many of the items listed in the architectural exterior and interior assessment will need to be addressed in the near future, since they are maintenance and upkeep items due to the age of the building. The engineering assessment highlighted items that are nearing the end of their life expectancy or that should be considered upon renovation or expansion.

The ADA or accessibility - specific items are related to a law and must be revised or a reasonable accommodation made for patrons or staff with disabilities. Any new space would be designed to meet ADA requirements.

When exploring an expansion, code compliance is a consideration. The building met code requirements upon construction in 1998.

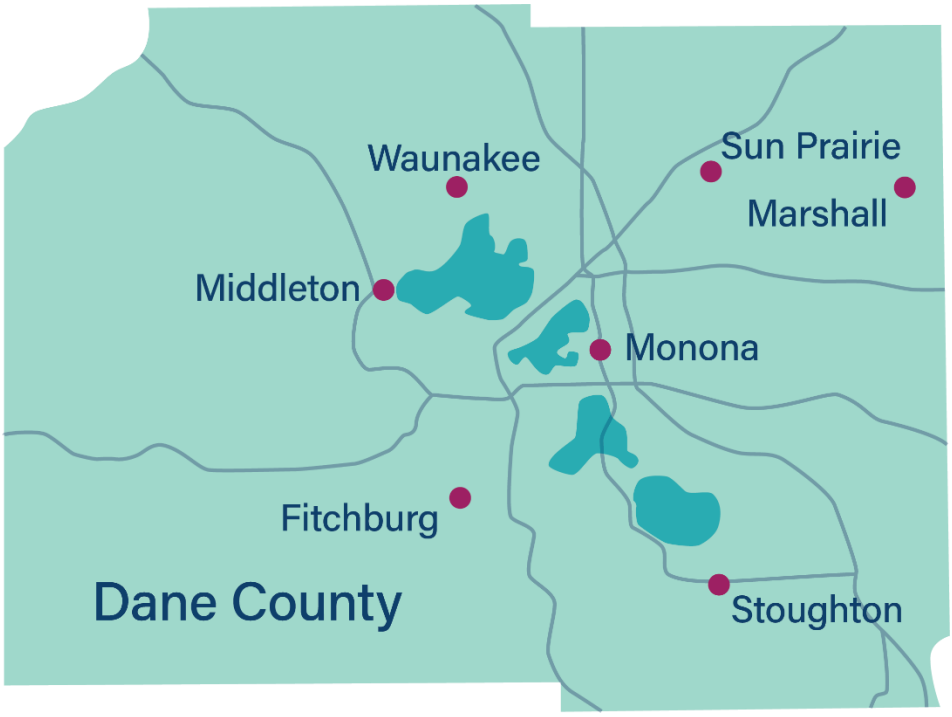
Any renovation of the existing, single-fire-area building that is less than fifty percent of the floor area, does not require the building to be completely brought up to current code standards. If more than fifty percent of the floor area is renovated, the entire building must be brought up to the current code standards. This would apply to egress, door hardware, occupancies, structural loading and lateral design, requirements for a sprinkler system due to building size, mechanical equipment and controls, and energy efficiency.

These considerations will play into expansion options and can be reviewed in more specifics at the upcoming charrette design workshop.

FEBRUARY 2020

Municipal Energy Plan - Seven Community Collaboration

Community Specific Chapters



slipstream

This document was prepared as an account of work by Slipstream on behalf of the following seven communities in Dane County, Wisconsin: Fitchburg, Marshall, Middleton, Monona, Stoughton, Sun Prairie, and Waunakee, through funding providing by the Wisconsin Office of Energy Innovation. Neither Slipstream, participants in Slipstream, the organization(s) listed herein, nor any person on behalf of any of the organizations mentioned herein:

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Sun Prairie: Sarah Sauer, Tim Semmann, Sandy Xiong, Scott Coulliard, Scott Kugler
Waunakee: Todd Schmidt, Bill Frederick, Lt. Joe Peterson, Clint Cry (WPPI Representative for Sun Prairie and Waunakee)

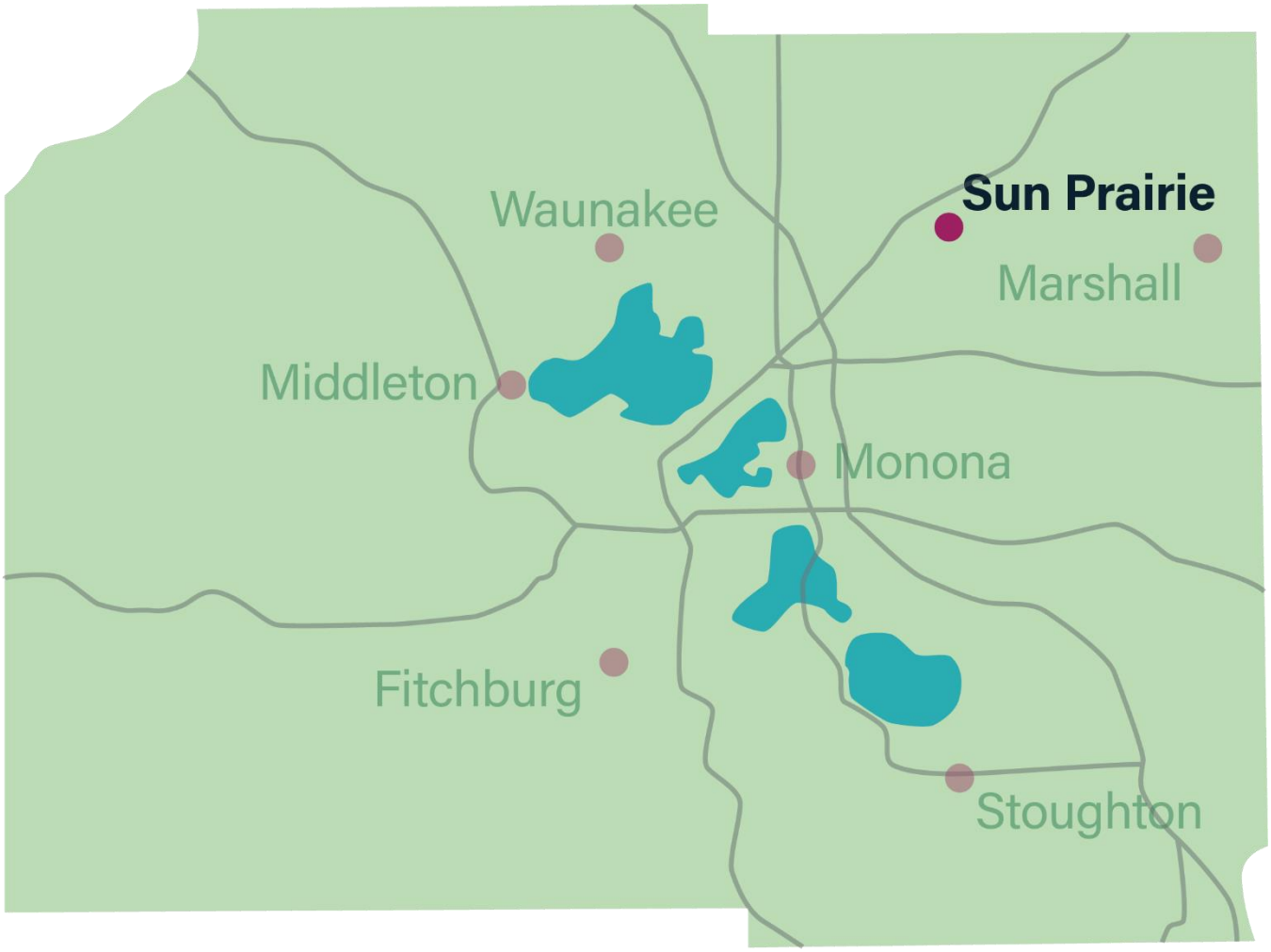
A NOTE ON THE THREE PARTS TO THE ENERGY PLAN

We divided the energy plan into three parts: a main report, community-specific reports (this document), and appendices. All three documents comprise the final energy plans developed for the Seven Community Energy Planning Collaboration of the Wisconsin Office of Energy Innovation Planning Grant.

The main report provides background on the project and process, and overarching recommendations that can be applied to all communities in this collaboration. The community specific reports (in this document) can be read as seven standalone chapters (one for each of the collaborating communities) that detail the community-specific municipal energy profile and corresponding recommendations. The appendices provide further detail should the reader want to dive deeper into the calculations and assumptions in the analysis.

SUN PRAIRIE

COMMUNITY-SPECIFIC MUNICIPAL ENERGY PLAN



Wisconsin Office of Energy Innovation Grant

SUN PRAIRIE BACKGROUND

Sun Prairie is a growing city of over 30,000 residents east of Madison. The city's electricity is supplied by the Sun Prairie Municipal utility which is part of the WPPI Energy, the regional power company that serves many municipal utilities. The WPPI representative for Sun Prairie utilities played an active role in this collaboration. The city's gas is supplied by both Alliant Energy and WE Energies. The City has taken a proactive role in investing in sustainable energy systems, including a recently installed 80 kW solar system on its City Hall as well as a new PV installation on the newly constructed Westside building. Sun Prairie is part of the Energy Independent Communities, which is a voluntary agreement between the State of Wisconsin and communities that adopt the goal of generating 25 percent of their energy from renewable energy sources locally by 2025. Recently, the City partnered with the Madison Metro Bus system to create an express bus route from Sun Prairie to the Capitol.

This chapter provides a detailed summary of the Sun Prairie energy plan. We begin by summarizing Sun Prairie's energy profile to provide a baseline understanding of current energy consumption, costs and carbon emissions for 2018. We then delve into our recommendations for near terms investments or action, split out into four categories: building energy efficiency, street lighting opportunities, fleet opportunities, and solar energy opportunities.

COMMUNITY ENERGY PROFILE

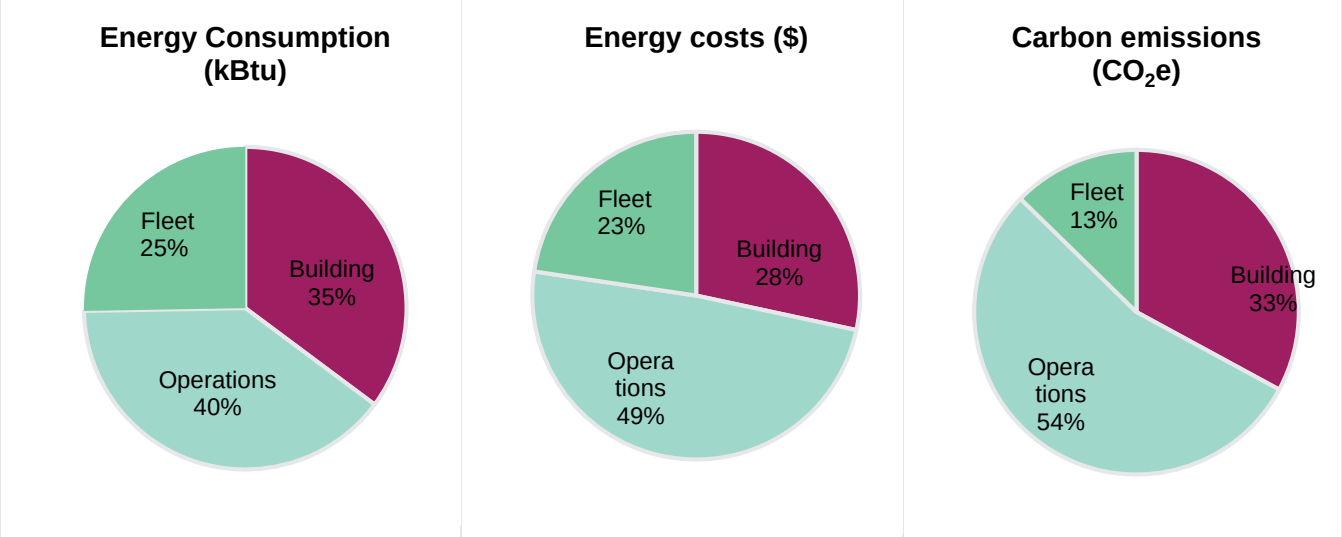
The three main energy inventory elements for Sun Prairie's energy profile include buildings, operations, and municipal fleet. Table 70 provides details by category on what was included in development of the Sun Prairie energy profile, based on the data provided by Sun Prairie staff.

Table 70: Sun Prairie inventory elements (2018 baseline)

Buildings	Operations	Fleet
Aquatic Center	Lift Stations	28 Police vehicles
City Garage	Parks and Recreation	18 Light-duty vehicles
City Hall	Streetlights	16 Emergency vehicles
EMS East	Wastewater Treatment Plant	23 Heavy-duty vehicles
Fire Department		45 Pickups
Library		64 Other
Museum		
Public Works		
Sun Prairie Utilities		
Westside Community Building		

Figure 18 shows the percent contribution of each source to total energy use, cost, and carbon emissions. The cost and carbon intensity of the different fuels (electricity, natural gas, gasoline, and diesel) can significantly impact the contribution of each source to the total.

Figure 18: Sun Prairie energy consumption, cost and carbon emissions (2018)



Breaking these elements down further, Table 71 details the annual energy use, carbon emissions, and energy cost associated with each building and operation use type. The buildings are listed individually; if there were multiple meters per building, we aggregated the values up to the building level. If there were multiple meters for operation data, it was aggregated by use type such as streetlights and lifts. Sun Prairie's City Hall hosts a net-metered PV system. The amount of electricity used by City Hall, as shown in the table, reflects the net amount of electricity that Sun Prairie purchased from the utility, with any reductions from solar panel production included as part of that amount.

Table 71: Sun Prairie baseline energy, carbon and cost data by building and operation use type (2018)

	Use/building	Net Electricity (kWh)	Natural gas (therms)	Carbon emissions (CO_2e metric tons)	Percent of total CO_2e	Energy cost
Buildings	Aquatic Center	152,000	14,736	194	3%	$25,560
	City Garage	10,126	1,859	18	0.3%	$2,230
	City Hall	609,824	16,862	554	8%	$77,200
	EMS East	43,832	3,908	54	0.8%	7,165
	Fire Department	111,575	7,236	123	2%	$16,615
	Library	479,680	21,159	478	7%	$65,460
	Museum	16,193	1,655	21	0.3%	$9
	Public Works	45,520	10,096	88	1%	$11,065
	Westside Community	558,680	36,645	620	9%	$83,440
	Sun Prairie Utilities	263,022	17	200	3%	$28,940
Operations	Parks and Recreation	30,851	4,096	45	1%	$5,850
	Streetlights	2,053,880	-	1,564	22%	$225,925
	Treatment Plants	2,648,344	43,755	2,249	31%	$317,570
	Lifts	34,832	-	27	0.4%	$3,830
	Fleet			906	13%	$255,775
Total		**7,058,359**	**162,024**	**7,141**		**$1,129,400**

Figure 19 illustrates how the baseline energy use intensity (EUI) of each Sun Prairie building compares to the ASHRAE 100-2018 target and benchmark value for similar use buildings. A few buildings were excluded as good benchmark comparisons did not exist. Additionally, it's important to note that the ASHRAE values represent a typical building type and do not account for buildings that may house multiple city departments or functions, such as the Westside Community Building which includes community spaces, EMS, fire and police department and parks department offices.

Figure 19: Sun Prairie EUI benchmarking and comparison to ASHRAE benchmark and target

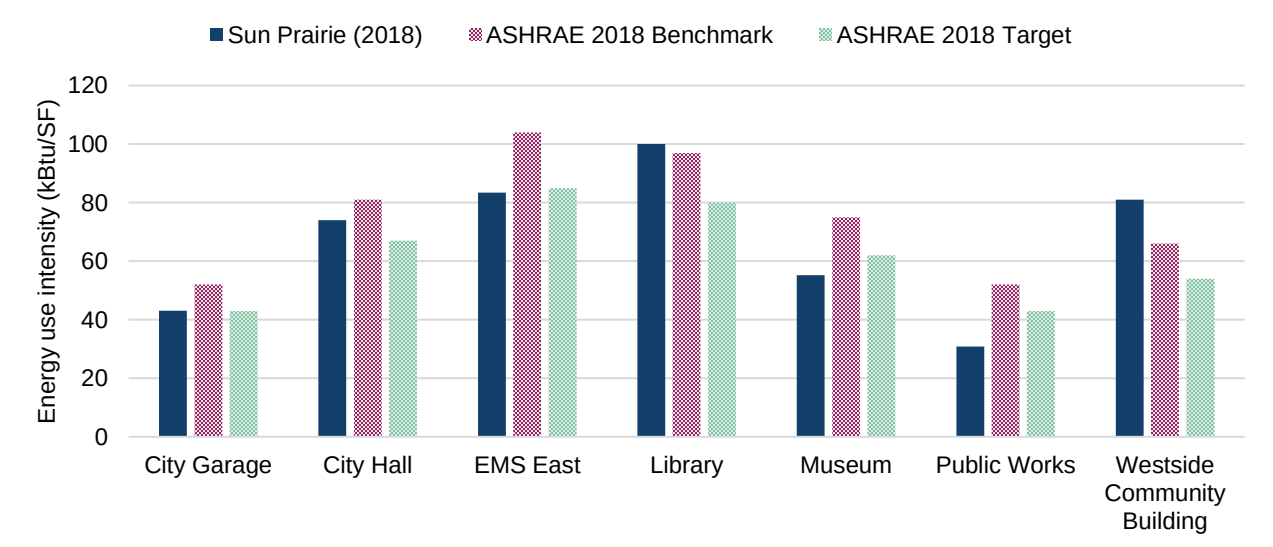


Table 72 illustrates the current renewable energy consumption in the city. On-site solar currently makes up around 4 percent of total electricity use in Sun Prairie – leaving potential for future developments. The city has two planned or installed on-site solar arrays: an 80 kW installation on City Hall and a forthcoming 130 kW installation on the Westside Community Building.

Table 72: Sun Prairie renewable energy summary - current production (as of 2019)

RENEWABLE ENERGY QUICK FACTS	
On-Site net metered solar (kWh)	261,780
Percent of gross municipal electricity	4%

Table 73 illustrates the current vehicle fuel usage, carbon emissions, and fuel cost by vehicle type. This includes both Sun Prairie utility and city vehicles. The police department has the most significant energy footprint, driven largely by the need to idle to maintain car functions while not in motion and the high relative mileage. This significant use presents an excellent opportunity for conversion to hybrid vehicles as will be outlined below.

Table 73: Sun Prairie vehicle fuel usage by vehicle type (2018)

Department	Number of vehicles	Gallons	CO_2e (metric tons)	Fuel cost
Police	28	37,515	319	$89,280
Light-duty	18	3,045 (+ 590 kWh)	26	$7,245
Emergency Vehicles	16	13,610	125	$35,915
Pickups	45	20,495	174	$48,775
Heavy-duty	23	9,175	94	$26,980
Other	64	28,020	167	$47,625
Total	195	111,860	905	$255,820

SUN PRAIRIE RECOMMENDATIONS FOR NEAR-TERM IMPLEMENTATION

Our analysis found energy investments that have a strong return on investment and significant energy savings potential. Implementing simple energy efficiency improvements to Sun Prairie's municipal buildings can reduce building energy consumption by almost 7 percent. By converting all streetlights to LEDs, Sun Prairie could cut annual streetlight electricity use in half – reducing utility costs and saving around 145 tons of carbon annually. In the fleet department, the City should prioritize converting police vehicles to hybrids as they offer a payback around one year and lead to a 40 percent decline in lifetime carbon emissions. Lastly, by adding solar arrays to 2 sites, the City can reduce fossil fuel electricity consumption by an additional 24 percent.

Table 74 summarizes the carbon and energy cost savings that the City would see if they implemented the recommended near-term actions in each major opportunity area. The following sections provide additional detail on each opportunity.

Table 74: Sun Prairie impact summary – estimated annual CO_2e and energy cost savings

Near-term Opportunity	CO_2e Reduction (metric tons)	Percent Carbon Reduction	Energy Cost Savings	Percent Energy Cost Reduction
Building efficiency	226	10%	$32,570	11%
Streetlights	738	47%	$106,605	47%
Fleet	141	16%	$41,365	16%
Solar	1,424	-	$205,620	-
Total opportunity	2,529	**35%**	$386,160	**34%**

Energy efficiency opportunities

Our analysis focused on near-term measures that not only have an energy or cost savings, but also may have possible benefits of reducing maintenance costs, improving occupant comfort, or increasing staff productivity. We also considered the ease and cost of implementation when prioritizing our recommendations.

To identify these opportunities, Slipstream conducted high-level walk-through for three buildings: the Sun Prairie City Hall, Sun Prairie Library, and Sun Prairie Westside Building. We took note of major end-uses and process, and spoke with building staff to understand building operations. The following provides a walk-through summary for each building with additional detail on energy savings potential below.

Sun Prairie City Hall

The Sun Prairie City Hall was built in 1994. It includes the city municipal functions as well as the eastside police department.

Observations

- HVAC system is water source heat pump system, which is ahead of its time given the age of the building.
- Planned upgrade to LED lighting. Currently testing different fixtures to choose best replacements.
- Offices had lighting occupancy sensors, but some have been removed or don't function.
- The first and second floors have potential for daylighting controls.

Recommendations

LED retrofit and lighting controls: Complete upgrade to LED. Consider vacancy sensors on light switches for small rooms and offices, similar to previous installation. Modern vacancy sensors may have improved over outdated design. Consider integrated light fixtures complete with occupancy sensors, photosensors, and wireless controls for meeting rooms and open offices on the 1st and 2nd floor. It will be easiest to add integrated light fixtures when upgrading to LED.

Task tuning: When upgrading lighting systems to LED and they include lighting controls, consider having a lighting contractor or representative task tune the system to match lighting levels to space lighting levels recommended by the Illuminating Engineering Society (IES). LED lamps tend to have higher lighting quality and appear "too bright". Lowering light levels slightly will save energy and increase occupant comfort.

Heat pump end of life replacement: Consider buying CEE Tier 2 or better heat pumps when replacing individual units at end of life. Refer to the 2109 CEE Commercial Unitary Air-Conditioning and Heat Pumps Specification for cooling and heating efficiency ratings.

Sun Prairie Library

The Sun Prairie Library was built in 1999. The building contains the library as well as a small TV station.

Observations

- There are a significant number of light fixtures throughout the library.
- LED lamps installed when old lamps burned out.
- Lights were on near windows.
- Previous roof leaks were identified.
- Difficulty maintaining temperature in children's room.

Recommendations

LED retrofit: Complete upgrade to LED. Consider de-lamping the large pendent light fixtures to reduce the amount of energy used. There are likely more lamps than required to light the space.

Lighting controls: Consider photosensors to harvest daylighting in perimeter spaces and the TV station office area. Consider vacancy sensors on to light switches for small rooms and offices.

HVAC controls: Consider adding a supply air temperature reset schedule to existing RTUs to save energy. This will increase the supply air temperature when its warmer outside.

Demand-controlled ventilation (DCV): Install carbon dioxide sensors in the main library area to lower outside air intake at the rooftop units when areas are unoccupied.

Reroofing: Consider adding additional roof insulation if the roof needs to be replaced.

Sun Prairie Westside Community Building

The Sun Prairie Westside Community Building was built in the mid-2000's and houses the westside police department, fire department, EMS, parks and recreations department, and event spaces.

Observations

- Well-designed building with good daylighting.
- Boiler was operating at 170 degrees in the summer.
- LED upgrades are planned for the near future.
- Thermal discomfort issues due to atrium glass.

Recommendations

LED retrofit: Complete upgrade to LED. Consider integrated light fixtures that complete with occupancy sensors, photosensors, and wireless controls for meeting rooms, open offices, and event spaces throughout the building. Consider full networked controls for event space lighting with wireless control to provide additional lighting flexibility for events.

HVAC controls: Implement supply air temperature reset and hot water temperature reset controls to save energy. The heating hot water system in particular was operating at 170 degrees during the middle of a summer day. In the summer, heating hot water supply temperature can be reduced to 150 degrees to save energy. This can be implemented with a boiler control sequence to reduce hot water temperature based on outdoor air temperature. Refer to the general section of the report for more information.

DCV: Install carbon dioxide sensors in the event spaces and large meeting areas to lower outside air intake at the air handling units (AHU) when rooms are unoccupied.

Destratification fans: Consider installing ceiling fans in the atrium to help push hot air down and away from the parks and recreation offices.

Energy Saving Potential

For each measure identified, we calculated the total savings and payback. Calculations were based on a combination of resources, including the Wisconsin Technical Reference Manual, the International Energy Conservation Code, and internal research and expertise. References and assumptions for energy saving calculations and cost data are in Appendix E. For more complicated measures, we developed simple energy models to quantify levels of impact. For details and definitions on the measures, please refer to the Main Report of the energy plan that has descriptions of the measures.

Table 75 provides additional detail on the energy efficiency opportunities for each building and includes energy costs savings and simple payback. Measures are organized by simple payback to identify measures that will recovers capital costs quickly. Completion of the already-planned upgrades to LED lighting are estimated to save the most electricity out of all measures we analyzed. While the measures are listed below separately, we recommend that lighting controls be implemented with LED upgrades to reduce total upfront costs. The savings listed below for controls are based on a building already upgraded to LEDs and the incremental costs below assume that the controls and LED upgrades are completed at the same time. Controls implemented on their own would have a higher upfront cost.

The next biggest energy saver is hot water temperature reset for the Library and Westside building. These controls will lower the boiler temperature in the summer, particularly for the Westside building which is operating at 170 degrees in the summer. Energy saving potential is also high for HVAC AHU temperature reset, which can be implemented through the existing AHU controls for each building. Finally, additional savings can be gained with DCV.

Table 75: Energy saving measures for Sun Prairie walk-through buildings

Building	Cost	Electric savings (kWh)	Gas savings (therms) [13]	Total energy savings	Cost savings	Simple payback (years)
City Hall						
Lighting controls - daylighting	$130	4,030	-90	0.1%	$390	0.3
Lighting controls - occupancy	$340	9,490	-210	0.3%	$920	0.4
LED lighting - task tuning	$980	6,000	-130	0.2%	$580	1.7
DCV - assembly space	$750	630	330	0.9%	$270	2.8
LED lighting retrofit - interior	$25,910	89,770	-2,000	2.8%	$8,670	3.0
City Hall Total	**$28,110**	**109,920**	**-2,100**	**4.3%**	**$10,830**	**1.6**
Library						
Lighting controls - daylighting	$120	3,710	-80	0.1%	$360	0.3
Lighting controls - occupancy	$120	3,500	-80	0.1%	$340	0.4
LED lighting - task tuning	$430	3,160	-70	0.1%	$310	1.4
HVAC AHU temp reset	$1,340	4,370	470	1.6%	$760	1.8
LED lighting retrofit - interior	$19,090	60,200	-1,340	1.8%	$5,820	3.3
DCV - assembly space	$570	380	200	0.6%	$160	3.5
HVAC boiler reset	$1,840	0	820	2.1%	$490	3.8

[13] Negative values reflect an increase in heating demand due to interactive effects – in all cases total savings is still positive.

Building	Cost	Electric savings (kWh)	Gas savings (therms) [13]	Total energy savings	Cost savings	Simple payback (years)
Library Total	**$23,510**	**75,320**	**-80**	**6.4%**	**$8,240**	**2.1**
Westside Community Building						
HVAC AHU temp reset	$290	4,190	450	1.1%	$730	0.4
HVAC boiler reset	$1,220	0	3,000	5.5%	$1,800	0.7
DCV - assembly space	$1,110	1,290	680	1.3%	$550	2.0
LED lighting retrofit - interior	$18,060	70,700	-1,580	1.5%	$6,830	2.6
Westside Community Building Total	**$20,670**	**76,180**	**2,560**	**9.5%**	**$9,920**	**1.4**
Grand Total	**$72,290**	**261,430**	**380**		**$28,980**	**1.8**

Finally, while we did not visit every building in Sun Prairie's municipal operations, we did see similar building types in the walk-throughs with other communities. For those buildings for which we were unable to conduct walk-throughs, we asked community representatives to provide some details on particular end-uses in each building. By using that feedback and leveraging information gathered during other communities' site visits, we were able to estimate savings for the other Sun Prairie buildings. These savings are summarized in Table 76. However, these results are not based on a site walk-through and should be confirmed based on further review of building equipment and conditions.

Table 76: Energy saving measures for Sun Prairie – non-site walk-through buildings

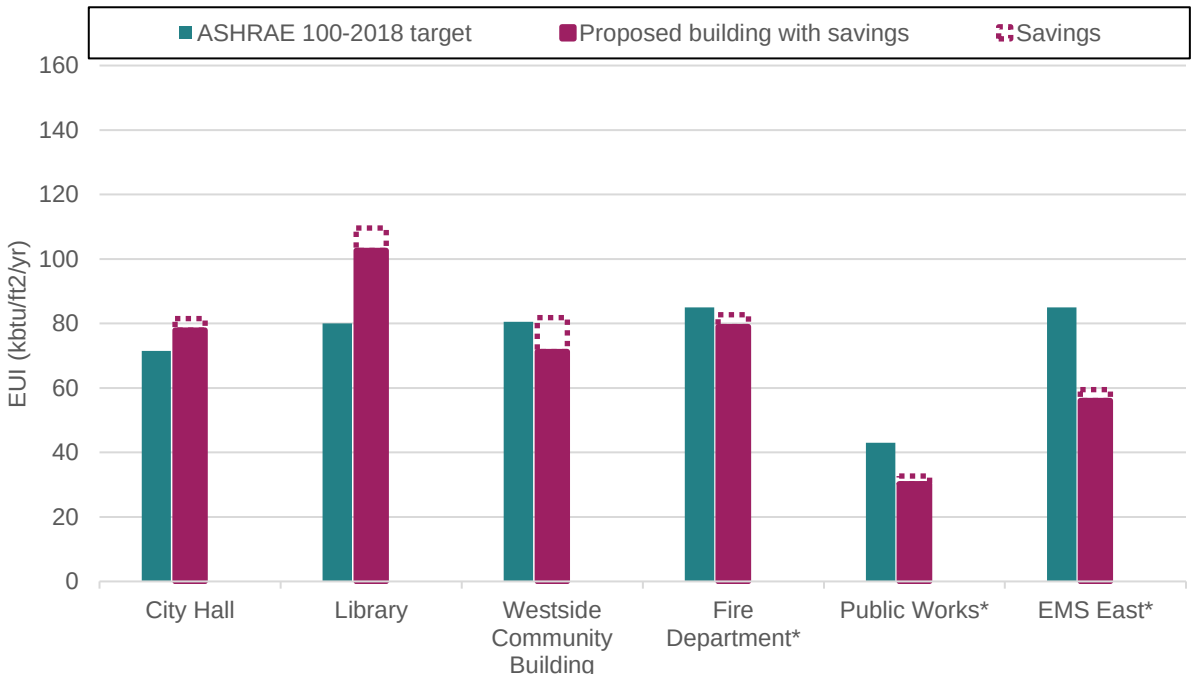
Building	Cost	Electric savings (kWh)	Gas savings (therms)	Total energy savings	Cost savings	Simple payback (years)
EMS East						
Lighting controls - daylighting	$40	1,300	-30	0.4%	$130	0.3
Lighting controls - occupancy	$40	1,220	-30	0.4%	$120	0.4
Lighting controls - garage	$20	390	-10	0.1%	$40	0.4
HVAC AHU temp reset	$190	790	90	2.9%	$140	1.4
DCV - assembly space	$50	70	40	1.0%	$30	1.7
LED lighting - task tuning	$190	1,100	-20	0.3%	$110	1.8
DCV - office space	$40	20	10	0.3%	$10	3.8
LED lighting retrofit - interior	$0	0	0	0.0%	$0	
EMS East Total	**$570**	**4,890**	**50**	**5.5%**	**$570**	**1.4**
Fire Department						
Lighting controls - daylighting	$20	700	-20	0.1%	$70	0.3
Lighting controls - occupancy	$20	660	-10	0.1%	$60	0.4
Lighting controls - garage	$20	520	-10	0.1%	$50	0.4
DCV - assembly space	$140	190	100	1.5%	$80	1.7
LED lighting - task tuning	$100	590	-10	0.1%	$60	1.8
HVAC AHU temp reset	$480	1,060	120	2.1%	$190	2.6
DCV - office space	$100	60	30	0.5%	$30	3.8
LED lighting retrofit - interior	$0	0	0	0.0%	$0	
Fire Department Total	**$880**	**3,780**	**190**	**4.4%**	**$530**	**1.6**

Building	Cost	Electric savings (kWh)	Gas savings (therms)	Total energy savings	Cost savings	Simple payback (years)
Public Works						
Lighting controls - occupancy	$90	2,540	-60	0.3%	$250	0.4
HVAC AHU temp reset	$290	4,160	450	5.3%	$730	0.4
Lighting controls - garage	$250	6,020	-130	0.6%	$580	0.4
LED lighting - task tuning	$410	1,150	-30	0.1%	$110	3.7
LED lighting retrofit - interior	$3,610	8,530	-190	0.9%	$820	4.4
Public Works Total	**$4,650**	**22,390**	**40**	**7.3%**	**$2,490**	**1.9**
Grand Total	**$6,100**	**31,060**	**280**		**$3,580**	**1.6**

Figure 20 shows the EUI of each building if all energy efficiency measures are implemented along with an ASHRAE Standard 100-2018 benchmark value for comparison.

Our analysis shows that the recommended efficiency measures can move the building's EUI towards the ASHRAE 100 target values for their respective building types. The Westside Community Building uses a significant amount of energy partly because it serves so many different functions, including 24/7 public safety functions. However, this also means there's more potential energy savings for this building. We expect that the other buildings would see some mild energy reductions, but we conservatively estimated energy savings because we did not conduct a walk-through.

Figure 20: Sun Prairie building EUI savings



* denotes buildings for which a walk-through was not performed. See accompanying text above for additional detail

Street Lighting Opportunities

Converting streetlights to LEDs has a large energy saving potential. In addition to reduced energy use annually, LEDs also last longer and thus reduce lifetime maintenance costs. The lights can also improve lighting quality, improve perception of safety, and reduce light pollution.

Table 77 illustrates the lifetime energy savings, carbon savings and cost savings associated with converting one high-pressure sodium fixture to a LED fixture. This standard lifetime analysis assumes that streetlights are owned by the municipality and serves to illustrate potential savings from a conversion. The upfront cost in Table 77, which includes both labor cost and material cost, is estimated from conversations with city officials who have implemented LED retrofits in the last few years. The Wisconsin Technical Resource Manual estimates the cost per fixture to be slightly higher. However, as LED costs are rapidly decreasing, we opted to use cost estimates from recent installations in an attempt to accurately represent current costs. The cost savings reported represent avoided maintenance costs and avoided energy costs. Appendix B provides more details on the assumptions made for these calculations.

Table 77: LED lifetime cost analysis - cost per fixture

Lighting type	Lifetime energy savings (kWh)	Lifetime CO_2e savings (metric tons)	Upfront cost	Lifetime cost savings	Payback period (years)
70 W	3,430	2.6	$249	$275	6.8
100 W	7,750	5.9	$249	$670	3.9
150 W	9,480	7.2	$299	$800	3.6
250 W	16,070	12.2	$399	$1,315	3.3
400 W	23,800	18.1	$499	$1,930	3

Table 78 illustrates the potential electricity, carbon, and energy cost savings from converting all streetlights to LEDs. Based on the wattage of current streetlights, we calculated the energy use from LED-equivalent bulbs and subtracted this from 2018 streetlight electricity usage. Using this energy savings value, we applied a standard carbon factor and electricity rate to estimate the carbon and cost savings.

Table 78: Sun Prairie streetlights - annual savings

STREETLIGHT ANNUAL SAVINGS	
Number of lights	2,615
Energy savings (kWh)	969,125
CO_2e savings (metric tons)	738
Energy cost savings	$106,605

Fleet Opportunities

The market for alternative fuel vehicles is rapidly developing. In the next five years, several new options will exist for municipal fleets, but at this point, the largest two opportunities are police and light-duty vehicles. A few niche alternatives exist for other vehicle types, but each of them has a substantial incremental upfront cost – making them less of a viable option. Based on conversations with the collaborating communities, we left these high incremental cost options out of our final recommendations, but our completed analysis can be found in the main report.

Table 79 illustrates the payback period for police vehicles and light-duty vehicles, assuming 14,000 miles driven for police vehicles and 3,500 miles driven for light-duty vehicles. As the numbers illustrate, hybrid police vehicles present a great opportunity for conversion – with a payback period around one year and a lifetime carbon reduction of between 40 and 55 percent. Although light-duty vehicles have less favorable payback periods, increasing the miles driven per vehicle would greatly improve these numbers. Once a vehicle hits around 10,000 to 15,000 miles driven a year, the net lifetime cost breaks even compared to a conventional car. For more details on the lifetime cost analysis, see Appendix C.

Table 79: Sun Prairie lifetime cost analysis – relevant alternative fleet vehicles

		Lifetime	Incremental vehicle cost	Annual cost savings	Lifetime savings	Payback period	Lifetime CO_2e reduction
Police Vehicle	**Hybrid Patrol SUV**	8	$3,500	$1,640	$10,200	**1.2**	41%
	Hybrid Patrol Sedan	8	$3,500	$2,170	$14,560	**1**	55%
Light-duty	**Passenger Vehicle**	15	$8,600	$350	-$3,700	-	43%
	Plug-in Hybrid SUV	15	$10,000	$215	-$7,000	-	35%
	Plug-in Hybrid Van	15	$9,000	$240	-$5,650	-	35%

Table 80 illustrates the savings from converting all light-duty and police vehicles in the Sun Prairie municipal fleet. The transition to hybrid police vehicles leads to the largest benefit – over a 40 percent reduction in both carbon emissions and fuel costs. Within the police vehicles, we do not include the conversion of the police pickup ad within the light-duty vehicles, we do not model the conversion of the Ford Transit van.

Table 80: Sun Prairie potential annual fuel savings - adoption of light-duty and police vehicles

		CO_2e (metric tons)		Fuel cost	
Department	Number of vehicles	Current	Alternative	Current	Alternative
Police	27/28	319	187	$89,280	$52,040
Light-duty	17/18	26	17	$7,225	$3,100

Solar Energy Opportunities

In addition to the two solar PV installations currently operational, which total 210 kW in demand, we also provided an in-depth analysis of two different sites in Sun Prairie. The analysis modeled a ground-mounted array on the library and a roof-mounted array on two buildings at the Wastewater Treatment Plant. Ground-mounted solar arrays offer a high degree of visibility for the project within the community. Locating a solar array at the library would ensure that the system would be seen by many residents as they visit the library. Visibility of the system enables the City to effectively lead by example in its transition to renewable energy. At the same time, system visibility of a ground-mounted array also may affect the neighbors of the site and the community by creating a visual change and affecting potential current and future use of the site. The City may seek to engage the owners of the neighboring properties during the project development process in order to identify any concerns and build support for the project.

Table 81 summarizes the potential solar production at each site. The recommended PV system size for each location considers the site's current electric consumption and the size and configuration of an array that each site could support. The Customer-Owned Generation Systems (Greater than 20 kW) rate offered by Sun Prairie Utilities allows for net metering for customer-owned generation facilities with generating capacity of less than 100 kW. The capacities of both arrays significantly exceeds the 100 kW threshold. The electric tariff requires that, for systems with capacity greater than 100 kW, the customer negotiate a buy-back rate with the utility. The addition of these arrays could greatly increase the percent renewable electricity in the city – up from 4 to 27 percent. This would allow Sun Prairie to meet its goal to power 25 percent of its municipal operations from renewable energy by 2025.

Table 81: Sun Prairie summary of solar potential by site

Site name	Address	Annual consumption (2018, kWh)	Potential PV capacity (kW DC)	Estimated production (kWh)	Savings
Library	1350 Linnerud Dr	479,680	338.7	469,394	98%
WWTP	3040 Bailey Rd	2,648,344	937.9	1,230,117	46%
Total		**3,128,024**	**1,276.6**	**1,699,511**	**54%**

Table 82 provides a summary of estimated costs of the recommended PV arrays. The estimated cost for the systems of $1,818.10 per kW is based on current data for the Dane County market for commercial PV installations. Since the cost estimates reflect market data, exact costs may vary by solar contractor.

WPPI offers rebates for commercial-scale solar installations through a competitive request for proposal program. The rebates, which are not guaranteed, are limited to a maximum of 50 percent of the total installed cost of the project or $125,000. This analysis assumes a rebate amount equal to 40 percent of the total project cost. Customers who receive grants from WPPI for solar installations may have to transfer ownership of the renewable energy credits from the project to WPPI.

Table 82: Estimated cost of recommended Sun Prairie PV arrays

Site Name	Total cost	WPPI rebate	Net cost
Library	$660,432	$125,000	$535,432
WWTP	$1,828,887	$125,000	$1,703,887
Total	**$2,489,319**	**$250,000**	**$2,239,319**

Table 83 provides a summary description of the array at each site as well as an aerial view of the arrays. The red outlines represent where the arrays would sit.

Table 83: Sun Prairie description of potential PV arrays

Description of site	Aerial views with potential PV mounting
The **Library** has open space on all sides, on which ground-mounted solar arrays could be installed. The model assumes racked, fixed-tilt panel, oriented in line with the building, at 30 degrees east of due south. Tilt is assumed to be 20 degrees and the GCR is 0.3. An array to the west of the building could take the place of one of the outlined segments. Alternatively, Sun Prairie may investigate installing shaded solar car parking or solar flags in its parking lot.	
The **Wastewater Treatment Plant** provides ample roof and land space to install solar arrays. To maximize the solar electricity produced to power the WWTP, we modeled a PV system with arrays on the roofs of two buildings and three ground-mounted sections. To distribute the cost of the project across a longer time period and/or to optimize access to grants and rebates, the City may choose to install the system in phases. The **north west building** has a pitched roof that is oriented east-west and has minimal penetrations or other obstructions. The modeled system includes flush-mounted arrays on both the east and west portions of the roof. The estimated capacity of the arrays on the roof of the northwest array would be 238.2 kW and is projected to produce 277,952 kWh per year.	 

Description of site	Aerial views with potential PV mounting
The **east building** has a pitched roof that is oriented east-west and has minimal penetrations or other obstructions. The modeled system includes flush-mounted arrays on both the east and west portions of the roof. The estimated capacity of the arrays on the roof of the northwest array would be 119.1 kW DC and is projected to produce 135,613 kWh per year. The **three ground-mounted** sections of the array would have racked, fixed-tilt panels, oriented due south. The model assumes a tilt of 20 degrees and a GCR of 0.3. The combined capacity of the three ground-mounted sections is 476.3 kW DC and is estimated to generate 695,202 kWh per year.	 

Maddie Koolbeck

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Slipstream – Research Analyst
Maddie provides analytical support for projects relating to energy efficiency, market characterization and potential, and emerging technology. She serves as a lead analyst on an evaluation of a state low-income weatherization program and a utility energy efficiency portfolio. She utilizes her economics and policy background to perform statistical analyses of programs and emerging technology, and to analyze the cost-effectiveness. She is also actively involved in Slipstream's research related to non-energy impacts and the impact on cost-effectiveness. She also assists with secondary research reviews and conducts surveys to further understand the current state of the market and stakeholder viewpoints.

Selected projects

Energy Planning for Municipalities. Maddie assisted with a municipal energy planning effort with seven communities in Dane County, Wisconsin. She provided analytical support to develop an energy profile for each community and identify near-term opportunities for transportation and streetlighting energy and carbon reductions.

Market Potential for Saving Energy and Carbon Dioxide with Load Shifting Measures. Maddie was the lead analyst on a Minnesota-funded project focused on understanding the energy, energy cost, and emissions impacts of measures that both save electricity and shift the time that load occurs. She led the development of the cost-effectiveness calculations for the project, as well as the development of the analytical framework.

Midwest Utility, Non-Energy Benefits Quantification. Maddie led the effort to quantify non-energy impacts for a Midwestern gas utility to incorporate into their regulatory filing. She quantified low-income participant benefits as well as air quality, water, and carbon benefits. She is also advising the utility on which benefits and costs to include in each cost-effectiveness test.

U.S. Department of Energy/Oak Ridge National Labs, Non-Energy Impacts for Weatherization. Maddie was a key member of a team that performed a literature review of current research on the non-energy impacts associated with the national Weatherization Assistance Programs. Maddie led the literature review and analysis of how to monetize various non-energy impacts for the project. The final report shares a discussion focused on issues for DOE to consider related to incorporating NEIs into WAP.

Iowa Energy Storage Assessment. Slipstream was involved in a project that investigated the benefits and barriers of energy storage in the state of Iowa. Maddie led interviews with several stakeholders in the state to identify the barriers to energy storage adoption, as well as what value streams stakeholders prioritized for energy storage.

Utility pilot program evaluation and surveys. Slipstream completed an evaluation of pilot demand response programs for Madison Gas & Electric. As part of these projects, Maddie directly aided in the development of the survey, the phone interviews with participants, and the analysis of both energy and survey data. She helped consolidate these results to communicate the impact of the programs on energy behavior as well as customer perceptions of the programs to the utility.

CenterPoint Energy, Integrating Health and Energy. Slipstream is also currently conducting a market research project focused on exploring how health and energy efficiency services could be integrated to better serve Minnesota families. Maddie is a key member of this team and will lead an analysis related to how the inclusion of non-energy impacts will include cost-effectiveness of CenterPoint's programs.

State energy policy analysis support. Maddie has been involved in Slipstream's support of the development of a clean energy plan for the state of Wisconsin and the analysis of the impacts of a proposed clean energy bill in another Midwest state. Maddie supported analysis of the impacts of various policy options, including the impact on carbon emissions, economics, and health. For one analysis, Maddie led the health impact analysis, utilizing the Environmental Protection Agency's Co-Benefits Risk Assessment Health Impacts.

Columbia Gas of Ohio impact evaluation. Maddie leads the impact evaluations of six residential and commercial efficiency programs for Columbia Gas, including their low-income weatherization program. The evaluations include analysis of pre/post billing data, and the application of engineering calculations from the state technical resource manual. She also performs cost-effectiveness calculations for each of the programs. Lastly, she performs ad-hoc analyses on potential programs to help Columbia Gas determine the viability of new programs or changes to program design.

Wisconsin Income-qualified Weatherization. Maddie helps with the analysis of the technical assistance portion of the Wisconsin Weatherization Assistance Program. She uses billing analysis to estimate the energy savings for close to 5,000 homes each year. The evaluation also includes the calculation of savings-to-investment ratios across all homes and across various heating fuels.

Heat pump pilot for Midwestern utility. Slipstream conducted a market characterization and technology analysis for heat pumps in Michigan. As part of this project, Maddie completed cost-effectiveness and emissions analyses on heat pump technologies and on several other emerging electric technologies.

Selected employment history

Chicago Council of Global Affairs. | Chicago, IL | May 2018 to August 2018
Intern, Global Cities – Energy and Climate
Maddie co-authored a Council report, "Building Urban Futures: City Carbon Actions Anchored in Building Codes and Standards," contributing to the literature review, interview, writing, and revision process.

Education

- Master of Public Affairs, energy analysis and policy concentration, University of Wisconsin—Madison
- Bachelor of Arts, economics and environmental studies, Coe College, Cedar Rapids, Iowa

Jeannette LeZaks
Slipstream | P: 608.210.7156 | jlezaks@slipstreaminc.org

Slipstream—Interim Director of Research & Innovation
Jeannette develops and manages residential, commercial, and industrial energy efficiency research projects. She applies technical research to examine how people use energy and combines skills in billing analysis, planning and econometrics to identify energy impacts and opportunities. Jeannette also develops survey and interview instruments, conducts interviews, and analyzes energy data to develop advanced program approaches that help utilities reach efficiency goals.

Selected Projects

Energy planning for municipalities. Jeannette led a municipal energy planning effort with seven communities in Dane County, Wisconsin. Slipstream managed the project, provided analytical support to develop an energy profile for each community and identified near-term opportunities for energy and cost reductions. The project also leveraged collaborative opportunities.

Market Potential for Saving Energy and Carbon Dioxide with Load Shifting Measures. Jeannette led a Minnesota-funded project focused on understanding the energy, energy cost, and emissions impacts of measures that both save electricity and shift the time that load occurs. The project developed a framework for understanding the load shifting impacts of more than a dozen measures, and also developed cost-effectiveness calculations for each.

Minnesota commercial energy baseline and market characterization study. Jeannette led a study to characterize the energy efficiency of new and renovated commercial building and identify specific opportunities for increased energy savings through and beyond existing commercial energy codes. The study included detailed plan reviews and site visits of recently renovated or constructed buildings. Jeannette managed the project and conducted analysis of the data collected.

Minnesota Energy Efficiency Potential Study. Jeannette provided technical and analytic assistance in a statewide potential study to estimate statewide electric and natural gas energy efficiency and carbon-saving potential and produce data-driven and stakeholder-informed resources defining market segments, end uses, measures, and programs that could be targeted in the decade ahead to realize the state's cost-effective energy efficiency potential. Through the process, the team engaged stakeholders in order to help advance robust energy policies and energy efficiency. Jeannette focused on incorporating her characterization work and behavioral research to strengthen the study results.

Small commercial characterization study. Jeannette co-led a study to characterize the small commercial sector in Minnesota and identify opportunities for utility programs to better serve this sector. Surveys, site visits, and secondary data collection was used to target a large sample of buildings and identify sector segments with the greatest potential for savings. Nearly 100 site visits were conducted at offices, restaurants, and grocery stories to identify energy saving opportunities and inform recommendations for promising program approaches designed to compel small business owners to consider reductions in heating, cooling, ventilation, and process loads, in addition to lighting.

Manufactured homes characterization and performance baseline survey. Jeannette managed a CARD-funded project to identify and characterize a representative sample of manufactured homes in Minnesota. She implemented the research design to gather a comprehensive set of housing and household data from these homes. The project also mined existing data sources for useful information on energy use and savings potential in manufactured homes and incorporated GIS techniques to estimate the potential energy savings from this segment by utility.

Research-based design of residential high user program. Slipstream completed a CARD-funded study in Minnesota to develop empirically-based program approaches for utilities to better serve residential customers with comparatively high electricity and natural gas use. Jeannette conducted interviews and walk-through home audits to determine the causes of the high usage and identify energy-saving opportunities. She also assisted with data analysis.

California low income needs assessment. Slipstream assisted Evergreen Economics with a needs assessment of low-income households in California. The project helped utility weatherization and rate-based programs better serve these households and reach goals of 100 percent participation. Jeannette was on a team of three interviewers who conducted 100 in-home interviews to better understand perceptions, needs, and willingness to participate under various scenarios of eligible households, including past non-participants. Jeannette conducted most interviews in Spanish.

Chicago area energy efficiency potential studies. Slipstream conducted comprehensive studies of achievable program-based energy savings for two Chicago natural gas utilities. Jeannette managed the overall logistics of this multifaceted project that involved residential and commercial customer phone surveys and on-site visits to establish baseline energy use characteristics. She also developed the analytical framework.

Minnesota multifamily energy efficiency potential. Jeannette was a key member of the team that conducted a comprehensive characterization of Minnesota's multifamily housing stock and provided a detailed accounting of the sector's energy savings potential to the Department of Commerce. We gathered information from building owners and tenants through online and mail surveys and also evaluated the payback period of 25 common energy and water savings measures in multifamily housing. Jeannette managed the development of the sampling protocols, data gathering and analysis.

Selected employment history

Affiliated Engineers, Inc.—Sustainable Planning Consultant
Jeannette worked with clients to incorporate sustainable design principles into new construction and existing building projects.

Peace Corps, Paraguay—Agriculture Extension Volunteer
Jeannette used her natural resources background to serve as a sustainable agriculture specialist in a small farming community. She provided technical assistance related to soil conservation techniques, alternative crop development, and home gardening related to nutrition education. She gained professional working proficiency in both Spanish and Guarani.

Education

- Master of Science, environment and resource, energy analysis and policy concentration, University of Wisconsin—Madison.

- Bachelor of Science, natural resources, Cornell University, Ithaca, New York.
- Nonprofit Management Certificate, University of Illinois—Chicago.

Memberships and associations

- Co-Chair, City of Madison's Sustainable Madison City Commission

LEE SHAVER

Slipstream | P: 608.210.7145 | lshaver@slipstreaminc.org

Slipstream—Energy Engineer
Lee's research and analyses focus on strategies and applications for advancing the smart grid, with an emphasis on microgrids and DER integration. Lee consults with building owners, architects, and engineers to apply energy conservation measures in commercial buildings.

Selected projects

Refrigeration thermal storage. Lee is involved in data collection, analysis, and potential studies for several different research projects related to thermal energy storage systems.

Saving energy and CO_2 with load shifting. Lee is involved in two different projects that study the potential for buildings in two midwestern states to contribute to energy savings and emissions reductions through load shifting measures.

ASHRAE Smart Grid Guide. Lee contributed the microgrid chapter in ASHRAE's first-ever guide for building professionals who seek to take advantage of the opportunities afforded by the smart grid. The guide offers architects, engineers, and building management professionals a starting place to learn about smart grid technologies and opportunities and how they can prepare their buildings-operational or planned-for integration with the smart grid.

ComEd Energy Efficiency Program new construction offering. Lee performs design review and energy modeling of commercial projects on the ComEd Energy Efficiency new construction offering. He engages with stakeholders and reviews designs, provides energy conservation measure recommendations and offers advice for best practices inenergy efficiency. He uses energy models and reviews relevant literature to evaluate different architectural and engineering design decisions.

Experience

PA Consulting Group—Global Energy and Utilities Consultant (2017)
Lee consulted with power producers, utilities, and investors to understand policy and market regulation, quantify risk, evaluate assets, and improve operations.

Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC) – University of Wisconsin-Madison) – Research Assistant (2014 – 2017)
Lee worked on a team developing home-scale, dc, meshed microgrids for off-grid electrification.

Quadlogic Controls, 2009 – 2014
Lee oversaw the reorganization of the technical services department, which handled tech support, factory repairs, commissioning, and field service.

Education

- Master of Science, Electrical Engineering, University of Wisconsin—Madison, 2017
- Bachelor of Science, Electrical Engineering, LeTourneau University, Longview, TX, 2007

Professional associations and industry involvement

- Member of IEEE, 2014 to present
- Member of SEPA's Microgrid Working Group, 2019 to present
- Member of the Wisconsin PSC 119 interconnection rulemaking advisory committee, 2021

XIAOHUI "Joe" ZHOU, Ph.D., PE, CEM.

Slipstream | 608.210.7115 | jzhou@slipstreaminc.org

Summary

More than 25 years of professional experience in building energy efficiency and demand response as an engineer, researcher, and project manager. Currently serving as a Principal Engineer, Dr. Zhou leads commercial building emerging technology R&D with a focus on advanced building controls and Grid-interactive Efficient Building (GEB). He possesses a combination of strong technical background (electrical and mechanical engineering) and research capability, hands-on industry experience in building design and applications, and program and project management and leadership skills, covering areas of building HVAC, sensors and controls, lighting, windows, building energy simulation, building-to-grid integration, and technology commercialization. Dr. Zhou collaborates with several DOE national labs, universities, utilities, manufacturers, building owners, ASHRAE, and federal agencies such as DOE, DoD, GSA, DOC/NSIT, and state and local governments.

Education

- 2005-2010, **Ph.D.**, Mechanical Engineering, Thermal Energy Systems, Iowa State University.
- 1998-2000, **M.S.**, Electrical Engineering, Control and Communication Systems, University of Connecticut.
- 1985-1989, **B.S.**, Electrical Engineering, Industrial Electrification and Automation, Zhejiang University.

Relevant Past Work Experience

Slipstream, Madison, WI.

Principal Engineer, 2018-present

- Strategy development and implementation of business activities including business development, new research ideas, research project design and execution, and client relationship management.
- Lead emerging technology R&D and serves as Principal Investigator (PI) or project manager for multi-million dollar projects sponsored by DOE, DoD, state agencies, ASHRAE, and utilities (See selected R&D project list below).
- Establish connections and collaborate with DOE national labs, universities, utilities, manufacturers, building owners, ASHRAE, and state and federal agencies.

Iowa State University/Iowa Energy Center, Ames, IA.

Program Manager, Energy Efficiency, 2011-2017

- Develop and manage Iowa Energy Center's competitive R&D grants
- Manage the Iowa Energy Center Energy Resource Station (ERS) – a facility for emerging building technology R&D**,** testing, and validation.
- Lead proposal writing and serve as PI for multi-million dollar external R&D projects sponsored by DOE, DoD, state agencies, and ASHRAE (See selected R&D project list below)

Assistant Scientist II / Associate Scientist, 2003-2011

- Conduct building R&D in the areas of sensors and controls, lighting, windows, and building energy simulation.
- Create, organize, and deliver energy efficiency-related educational and training programs for Iowa building professionals.

- Manage the ERS building automation systems

The University of Iowa, Iowa City, IA.
Research Assistant, 2002-2003
- Assist in building R&D projects conducted at Iowa Energy Center ERS. Provide technical support for the ERS building automation system (Johnson Controls METASYS and Andover Continuum).

Johnson Controls, Beijing, China.
Building Controls Application Engineer, 1996-1998
- Design and implement building controls and fire protection projects for large commercial buildings.

Selected R&D Projects (2011 to present)

- **2021. Minnesota Department of Commerce:** MN CARD ASHRAE Guideline 36 field demonstration. $390k. PI.
- **2020. GSA/DOE:** Grid-interactive efficient building (GEB) software pilots. 70k. PI.
- **2020. Slipstream:** Grid-interactive efficient building (GEB) testbed. $120k. PI.
- **2020. DOE:** DE-EE0009083 Demo. of integrating connected lighting, automated shades, and intelligent energy storage to provide flexible building loads. $914k. PI.
- **2020. ComEd:** Switch Reluctance Motor (SRM) pilot project. $84k. Project advisor.
- **2020. Iowa Economic Development Authority (IEDA):** Iowa Energy Storage Economic Development Assessment. $100k. Project advisor.
- **2019. DOD:** ESTCP EW19-5055 Comprehensive Information Transfer Approaches for Advanced Building Controls and Management Projects. $470k. Key presenter.
- **2019. DOE:** DE-EE0008190 Integrated Controls Package for High-Performance Interior Retrofit. $909k. Project manager.
- **2019. ASHRAE:** Smart Grid Application Guide: Integrating Facilities with the Electric Grid. $99k. Primary author.
- **2019. ComEd:** Smart Valve Demonstration. $60k. Contributor.
- **2018. ComEd:** Q-Sync Motor Field Demonstration. $108k. PI.
- **2018. ASHRAE:** 1819 CO2 Demand Controlled Ventilation in Multiple Zone VAV Systems with Multiple Recirculation Paths. $96k. Co-PI.
- **2018. ASHRAE:** 1814 Actual Energy Performance of Secondary Schools and Medium Offices Designed to Comply with ASHRAE Standard 90.1-2010. $144k. PI.
- **2018. DOE:** All-Digital Plug and Play Passive RFID Sensors for Energy Efficient Building Control. $1.4 million. Team member and consultant.
- **2017. ASHRAE:** RP-1702 Case Studies to Test Performance Measurement Protocols. 160k. Co-PI.
- **2017. ASHRAE:** RP-1710 Effects of Dynamic Shading Devices on Daylighting and Energy Performance of Perimeter Zones. $112k. Field Testing.
- **2017. ASHRAE**: RP-1747 Implementation of DCV for Multiple Zone HVAC Systems. $173k. Co-PI.
- **2017. DOD:** ESTCP EW-201408 Demonstration of Energy Savings in Commercial Buildings for Tiered Trim and Respond Method in Resetting Static Pressure for VAV Systems. $497k. PI.
- **2016. ASHRAE:** RP-1681 Low Energy LED Lighting Heat Gain Distribution in Buildings. $160k. P.I.
- **2016. ASHRAE:** RP-1587 Control Loop Performance Assessment. $110k. Field Testing.
- **2015. DOE:** Iowa Building Benchmarking Project Phase II. $395k. PI.

- **2013. DOE:** Iowa Building Benchmarking Pilot Project. $495k. PI.
- **2012. DOE/PLEOTINT:** Sunlight Responsive Thermochromic Window Demonstration. $56k. PI.
- **2012. ASHRAE:** RP-1353 Stability and Accuracy of VAV Box at Low Flows. Field Testing.
- **2012. ASHRAE:** RP-1312 Fault Detection and Diagnostics. Field Testing.
- **2011. DOC/NIST:** Building HVAC System Faults: A Controlled Laboratory Experiment and Analysis. $234k. PI.

Professional Association

1. Member of ASHRAE. 2002-present. Current and past positions:
    - Distinguished Service Award, 2017.
    - Voting member, ASHRAE Standard Project Committee 195 (SPC 195) Method of Test for Rating Air Terminal Unit Controls.
    - Voting member, ASHRAE SPC 211 Standard for Commercial Building Energy Audits.
    - Voting member, ASHRAE Standing Guideline Project Committee 36 (SGPC 36) High-Performance Sequences of Operation for HVAC Systems.
    - Member of technical committees TC 1.4 Control Theory and Application, TC 1.5 Computer Applications, and TC 7.5 Smart Building Systems.
    - TC 1.5 vice-chair, emerging technology subcommittee chair.
    - TC 7.5 program subcommittee chair, the handbook subcommittee chair, secretary.
    - ASHRAE Central Iowa Chapter program committee chair.
    - ASHRAE Madison Chapter Chapter Technology Transition Committee (CTTC) chair, director-at-large.
2. Member of Association of Energy Engineers (AEE). 2017-2020).

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City of Sun Prairie Annex

Community Profile

The City of Sun Prairie, is located northeast of the City of Madison. The City is located on several major transportation corridors, including US Highway 151. The predominant land uses within Sun Prairie's borders are residential and commercial. As of the 2010 Census, there are 29,364 people, 11,636 households, and 7,641 families residing in the City of Sun Prairie. The population density is 2401.4 people per square mile. There are 12,413 housing units at an average density of 1015.1 units per square mile. The population age profile as of 2010 is shown in Table 1.

Table 1 Population Age Profile

Category	Number	Percent
Total population	29,364	100.0
Under 5 years	2,498	8.5
5 to 9 years	2,370	8.1
10 to 14 years	2,129	7.3
15 to 19 years	1,765	6.0
20 to 24 years	1,603	5.5
25 to 29 years	2,562	8.7
30 to 34 years	2,566	8.7
35 to 39 years	2,376	8.1
40 to 44 years	2,145	7.3
45 to 49 years	2,070	7.0
50 to 54 years	1,836	6.3
55 to 59 years	1,594	5.4
60 to 64 years	1,242	4.2
65 to 69 years	804	2.7
70 to 74 years	546	1.9
75 to 79 years	448	1.5
80 to 84 years	374	1.3
85 years and over	436	1.5

Data Source: 2010 U.S. Census

According to the 2014 American Community Survey, the median income for a household in the City of Sun Prairie is $66,956 and the median income for a family is $76,909. The per capita income for the City of Sun Prairie is $30,905. 95.2% of the population has at least a high school degree, while 42.5% of the population holds at least a bachelor's level degree.

Hazard Identification and Risk Assessment

A hazard identification and vulnerability analysis was completed for the City of Sun Prairie using the same methodology in the base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality to complete.

The first step in a hazard analysis is to identify which hazards the community is vulnerable to. Table 2 outlines the hazard identification for the City of Sun Prairie based on the Data Collection Guide. The Data Collection Guide listed all of the hazards that could impact anywhere in Dane County. The purpose of this worksheet was to identify and rank the hazards and vulnerabilities specific to the jurisdiction. The City of Sun Prairie's planning team members were asked to complete the matrix by ranking each category on a scale of 0 to 5 based on the experience and perspective of each planning team member. A ranking of 0 indicated "no concern" while a ranking of 5 indicated "highest concern."

This matrix reflects that the City of Sun Prairie has the highest vulnerability to flood, tornado, and winter storm. The vulnerability established here is a qualitative assumption based on the impacts, geographic extent, probability of future occurrence, and magnitude/severity.

Table 2 Vulnerability Assessment Matrix for the City of Sun Prairie

Hazard	Hazard Attributes			Impact Attributes						
				Primary Impact (Short Term - Life and Property)			Secondary Impact (Long Term – Community Impacts)			
	Area of Impact	Past History, Probability of Future Occurrence	Short Term Time Factors	Impact on General Structures	Impact on Critical Facilities	Impact on At-Risk Populations	Social Impact	Economic Impact	Severity Of Other Associated Secondary Hazards	
	(1-5)	(1-5)	(1-5)	(0-5)	(0-5)	(0-5)	(0-5)	(0-5)	(0-5)	**Total**
Dam Failure	1	1	1	0	0	0	0	0	0	3
Extreme Cold	5	3	3	1	3	4	2	2	2	25
Extreme Heat	5	3	3	1	3	4	2	2	2	***25***
Drought	5	2	2	1	1	3	2	3	2	***21***
Flood	5	3	4	4	5	4	2	4	4	***35***
Fog	5	3	3	0	0	0	1	1	0	***13***
Hail Storm	3	3	4	4	2	1	2	3	2	***24***
Landslide	1	1	1	0	0	0	0	0	0	***3***
Lightning	1	4	4	3	3	1	1	2	1	***20***
Tornado	3	2	4	5	5	4	4	5	4	***36***
Wildfire	1	1	5	5	4	0	1	2	2	***21***
Windstorm	5	4	4	4	4	2	3	4	3	***33***
Winter Storm	5	5	4	3	4	3	5	4	4	***37***

Data Source: City of Sun Prairie Data Collection Guide, 2015

Previous Hazard Events

Through the Data Collection Guide, the City of Sun Prairie noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the base plan. These events had a particular impact on the community beyond the impacts and events recorded in the Dane County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction. The events noted by this jurisdiction in the Data Collection Guide include:

Windstorm: June 1, 2013

Fences, crops, and powerlines were all damaged when a strong windstorm struck the area near County Highway C and State Highway 19. The damage was substantia enough to cause road closures for a short amount of time.

Windstorm: June 18, 2014

A windstorm impacted the entire City of Sun Prairie causing widespread roof and tree damage. Powerlines were also damaged. Disaster relief funding was used as part of the recovery and mutual aid agreements were used to aid in the cleanup effort.

Windstorm: July 13, 2015

The north side of Sun Prairie was struck by a windstorm that damaged trees. The storm caused minimal economic impact.

Asset Inventory

Assets include the people, property, and critical facilities within the City of Sun Prairie that are exposed to hazards in general. Inventories of property, essential infrastructure, and natural, cultural or historic resources help provide a comprehensive picture of the community and provide a method of assessing exposure to hazards by establishing the improved and total values, capacities and populations for these assets. It also forms the basis for estimating potential losses, where possible.

Population

Table 3 Vulnerable Population Summary

Disability Status from the 2014 American Community Survey	Number	Percent of Group with Disability
Population Under 5 years old with a Disability	0	0%
Population 5-17 years old with a Disability	267	4,5
Population 18-64 with a Disability	1,743	9.1
Population Over 65 years old with a Disability	876	31.2
Total Population with Disability	2,886	9.5

Other Vulnerable Populations	Estimate	Percentage
Families Below Poverty Level	503	6.2
Individuals Below Poverty Level	2,729	9.0
Of those poverty: Individuals Under 18	1,125	13.6
Of those poverty: Individuals Over 65	186	6.6
Total Population Over 5 who Speak English less than "very well"	734	2.6
2014 ACS Total Population Estimate	30,601	100%

Data Source: 2014 American Community Survey

General Property

Table 4 Property Exposure Summary

Property Type	Total Parcel Count	Improved Parcel Count	Improved Values ($)	Content ($)	Total Value ($)
Totals	**9,339**	**7,704**	**1,598,253,600**	**799,126,800**	**2,397,380,400**
Agriculture	25	1	141,300	70,650	211,950
Commercial	244	235	161,874,700	80,937,350	242,812,050
Utilities	62	2	339,100	169,550	508,650
Industrial	66	62	61,371,300	30,685,650	92,056,950
Institutional/ Governmental	64	16	5,629,900	2,814,950	8,444,850
Other	1,802	415	117,759,700	58,879,850	176,639,550
Residential	7,076	6,973	1,251,137,600	625,568,800	1,876,706,400

Data Source: Dane County Land Information Office

Critical Facilities

The City of Sun Prairie has identified the following critical facilities important to protect from disaster impacts. These are collected in Tables 5.These are based on the Data Collection Guide and information submitted by the City.

Table 5 Critical Facility Summary/Essential Infrastructure

Name of Asset	Type (See Below)	Replacement Value
Business Park	VF - Vulnerable Facilities	$3,072.00
Chase House	VF - Vulnerable Facilities	$22,449.00
Chase House	VF - Vulnerable Facilities	$218,142.00
Family Aquatic Center	VF - Vulnerable Facilities	$23,703.00
Family Aquatic Center	VF - Vulnerable Facilities	$423,703.00
Family Aquatic Center	VF - Vulnerable Facilities	$127,113.00
Family Aquatic Center	VF - Vulnerable Facilities	$161,778.00
Fleet Maintenance Facility	EI - Essential Infrastructure	$140,624.00
Fleet Maintenance Facility	EI - Essential Infrastructure	$2,234,045.00

Name of Asset	Type (See Below)	Replacement Value
Lift Station – Village	EI - Essential Infrastructure	$120,000
Lift Station – Columbus	EI - Essential Infrastructure	$30,000
Lift Station – Business Park	EI - Essential Infrastructure	$40,000
Lift Station – Shonas	EI - Essential Infrastructure	$70,000
Lift Station – Hickory Grove	EI - Essential Infrastructure	$80,000
Lift Station – Patrick Marsh	EI - Essential Infrastructure	$70,000
Lift Station – Wyndham	EI - Essential Infrastructure	$80,000
Lift Station – Meadows	EI - Essential Infrastructure	$90,000
Lift Station – Wilburn	EI - Essential Infrastructure	$90,000
Lift Station – Creekview	EI - Essential Infrastructure	$100,000
Municipal Building	EI - Essential Infrastructure	$13,311,543.00
Municipal Building	EI - Essential Infrastructure	$276,053.00
Museum	VF - Vulnerable Facilities	$691,109.00
Orfan Community Park	NA - Natural Assets	$194,219.00
Parks Facilities	VF - Vulnerable Facilities	$710,031.00
Pole Storage	VF - Vulnerable Facilities	$142,169.00
Pole Storage	VF - Vulnerable Facilities	$140,511.00
Public Library	VF - Vulnerable Facilities	$6,716,893.00
Public Safety Building	EI - Essential Infrastructure	$19,499.00
Public Safety Building	EI - Essential Infrastructure	$19,499.00
Public Safety Building	EI - Essential Infrastructure	$3,809,334.00
Public Works (DPW)	EI - Essential Infrastructure	$204,650.00
Public Works (DPW)	EI - Essential Infrastructure	$99,430.00
Public Works (DPW)	EI - Essential Infrastructure	$248,689.00
Public Works (DPW)	EI - Essential Infrastructure	$2,219,975.00
Public Works (DPW)	EI - Essential Infrastructure	$763,308.00
Recycle Center	VF - Vulnerable Facilities	$230,644.00
Sheehan Park	NA - Natural Assets	$36,722.00
Sheehan Park	NA - Natural Assets	$128,526.00
Sheehan Park	NA - Natural Assets	$83,651.00
Sheehan Park	NA - Natural Assets	$116,590.00
South Substation	EI - Essential Infrastructure	$9,031.00
Stoneridge Estates	NA - Natural Assets	$87,926.00
Substation-1731 Science Drive	EI - Essential Infrastructure	
Substation-2228 Colorado Ave.	EI - Essential Infrastructure	
Substation-326 Linnerud Drive	EI - Essential Infrastructure	
Substation-646 S. Thompson Road	EI - Essential Infrastructure	
Substation-991 N. Bird Street	EI - Essential Infrastructure	

Name of Asset	Type (See Below)	Replacement Value
Wastewater Treatment Plant	EI - Essential Infrastructure	$930,574.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$359,850.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$497,923.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$1,938,648.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$1,275,537.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$433,535.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$715,919.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$241,185.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$1,459,689.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$824,170.00
Wastewater Treatment Plant	EI - Essential Infrastructure	$348,240.00
Water & Light	EI - Essential Infrastructure	$845,548.00
Water & Light	EI - Essential Infrastructure	$3,712,583.00
Water & Light	EI - Essential Infrastructure	$1,733,727.00
Water Tower-910 Linnerud Drive	EI - Essential Infrastructure	
Water Tower-991 N. Bird Street	EI - Essential Infrastructure	
Well House #3	EI - Essential Infrastructure	$48,023.00
Well House #3	EI - Essential Infrastructure	$47,463.00
Well House #4	EI - Essential Infrastructure	$52,345.00
Well House #4	EI - Essential Infrastructure	$51,735.00
Well House #5, Colorado Sub Station	EI - Essential Infrastructure	$169,976.00
Well House #5, Colorado Sub Station	EI - Essential Infrastructure	$80,193.00
Well House #5, Colorado Sub Station	EI - Essential Infrastructure	$79,258.00
Well House #6	EI - Essential Infrastructure	$54,574.00
Well House #6	EI - Essential Infrastructure	$53,938.00
Well House #7	EI - Essential Infrastructure	$118,490.00
Well House #7	EI - Essential Infrastructure	$117,108.00
Well House #8	EI - Essential Infrastructure	$179,984.00
Well House #8	EI - Essential Infrastructure	$177,885.00
Well House #9	EI - Essential Infrastructure	$83,411.00
Westside Facility	EI - Essential Infrastructure	$19,788.00
Westside Facility	EI - Essential Infrastructure	$12,936,266.00
Wetmore Park	NA - Natural Assets	$36,722.00
Wetmore Park	NA - Natural Assets	$63,629.00
Wetmore Park	NA - Natural Assets	$73,440.00
		$63,375,987.00

Data Source: City of Sun Prairie Data Collection Guide, City of Sun Prairie

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: Natural Assets

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The previous inventory tables quantify what is exposed to the various hazards within City of Sun Prairie. Table 6 cross-references the hazards with the various tables where exposure or vulnerability specifics are found. The intent of Table 6 is to quantify, where possible, future impacts of each hazard on the jurisdiction. In many cases it is difficult to estimate potential losses, so the overall exposure of populations, structures, and critical facilities is referenced.

Table 6 Hazard Vulnerability Specifics

Hazard	Populations	Structures	Critical Facilities	Future Damage Potential
Dam Failure	None	None	None	Specifics unknown; See hazard profile in County Plan
Drought	Minimal	None	Minimal	Specifics unknown; See hazard profile in County Plan
Flooding	See section below	See section below	See section below	See section below
Fog	Minimal	None	None	Specifics unknown; See hazard profile in County Plan
Hailstorm	Minimal	See Property Exposure table 3	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Landslide/ Sinkholes/ Erosion	Minimal	Minimal	Minimal	Specifics unknown; See hazard profile in County Plan
Lightning	See Table 2 Population	See Table 3 Property Exposure	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Severe Cold	See Table 2 Population	See Table 3 Property Exposure	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Severe Heat	See Table 2 Population	None	Minimal	Specifics unknown; See hazard profile in County Plan
Severe Winter Storm	See Table 2 Population	See Table 3 Property Exposure	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Tornado	See Table 2 Population	See section below	See Critical Facility Inventory Table(s)	See section below
Wildfire	Minimal	Minimal	Minimal	Specifics unknown; See hazard profile in County Plan

Hazard	Populations	Structures	Critical Facilities	Future Damage Potential
Windstorm	See Table 2 Population	See Table 3 Property Exposure	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan

Flood

Structures and Properties in the Floodplain

Refer to the flood profile in the County plan for a description of the methodology used to identify potentially flood-prone properties. Tables 7 and 8 outline the primary structures and properties with primary structures on them within the City of Sun Prairie. Potential number of individuals at risk figures are based on primary residential structures and the average household size within Dane County.

Table 7 Primary Structures in the Floodplain

Total Floodway Structures	Floodway Residential Structures	Total Structures in 100 year Floodplain	Residential Structures in 100 year Floodplain	Potential Number of Individuals at Risk in 100 year Flood	Total Structures in 500 year Floodplain	Residential Structures in 500 year Floodplain	Potential Number of Individuals at Risk in 500 year Flood
0	0	1	1	2.33	6	5	11.65

Source: Analysis based on Dane County Land Information Office Data

Table 8 Properties with Primary Structures in the Floodplain

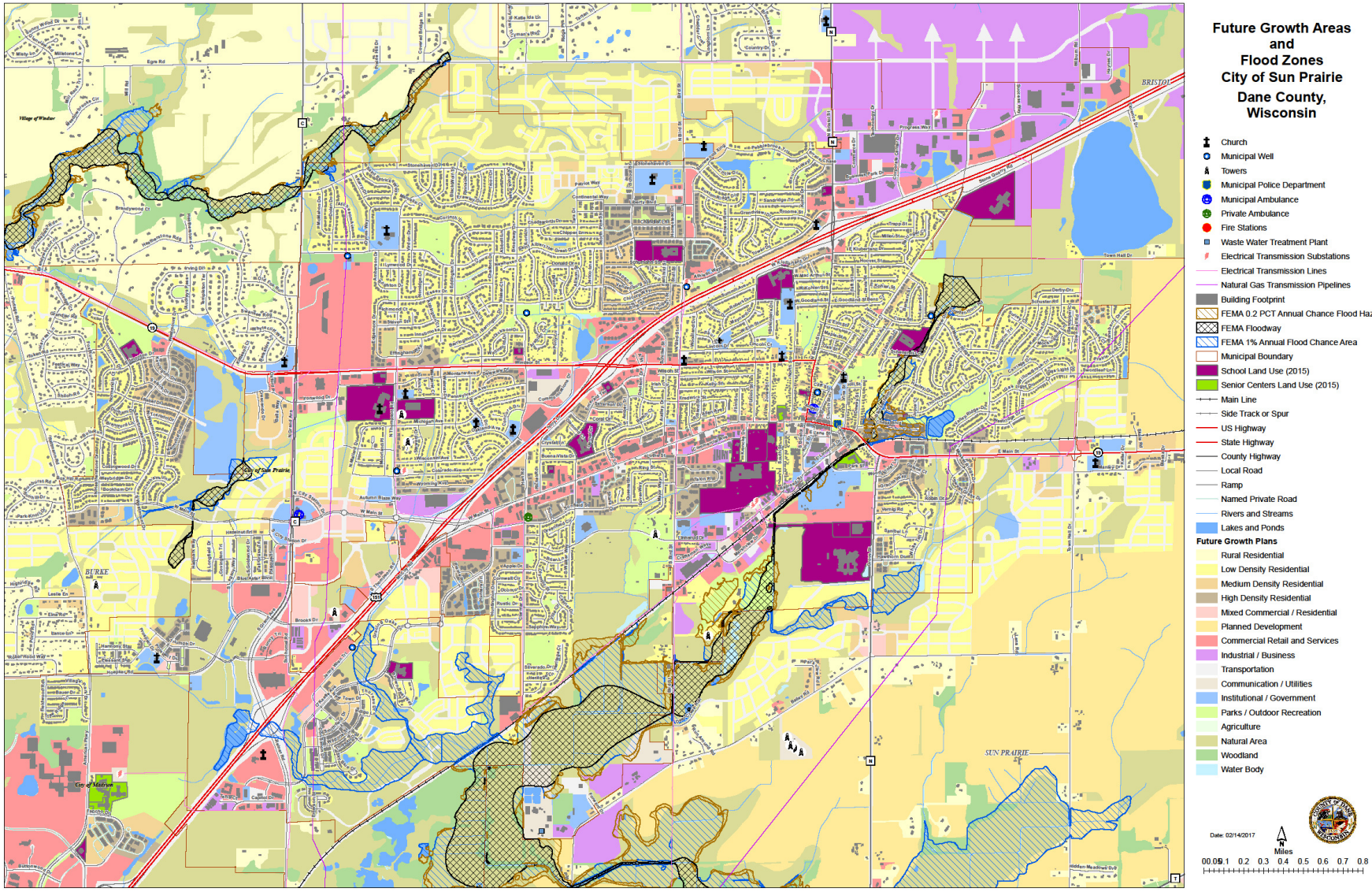
Total Floodway Properties	Floodway Improved Values	Floodway Residential Properties	Total Properties in 100 year Floodplain	Total Improved Value of Properties in 100 year Floodplain	Residential Properties in 100 year Floodplain	Total Properties in 500 year Floodplain	Total Improved Value of Properties in 500 year Floodplain	Residential Properties in 500 year Floodplain
0	$0	0	1	$832,200	1	6	$1,534,000	5

Source: Analysis based on Dane County Land Information Office Data

Repetitive Loss Properties and Flood Insurance Polices

There are no repetitive loss properties within the City of Sun Prairie. According to FEMA Policy and Claim Statistics for Flood Insurance, the community has 17 flood insurance polices, with a total coverage amount of $5,349,000. There have been 2 claims and $2,964 in losses paid in flood insurance claims since 1978.

Figure 1 Flood Hazards and Future Land Use Map



Tornado

While it is difficult to estimate specific losses to a tornado due to the random nature of the event, a methodology was developed that was applied to each jurisdiction during the 2015 update. The table below estimates the percent area of the jurisdiction that could be impacted based on the average sized tornado (F2) in Dane County. High value exposure is based on 100% loss, medium 50% loss, and low is 25% loss to the property potentially impacted. The loss ratio, which is the ratio of the damaged building value to total exposed building value, is a measure of the impact to the jurisdiction as a whole. Communities with loss ratios 10% or more may have difficulty recovering from a disaster. Refer to the tornado hazard profile in the main mitigation plan for more details on this methodology.

Table 9 Tornado Loss Estimate

% Area of Impact	Improved Parcel Count	Affected Structure Estimate	Total Exposed Value	Estimated Loss $ - High Damage Range	Estimated Loss $ -Moderate Damage Range	Estimated Loss $ - Low Damage Range	Loss Ratio for Moderate Damage Range
7.00%	12,613	882	$12,313,821,300	$861,492,027	$430,746,013	$215,373,006	3.5%

Source: Analysis based on Dane County Land Information Office's data

Growth and Development Trends

Planned land use is shown in Figure 1, in relation to the flood hazard. Table 10 illustrates how the City of Sun Prairie has grown in terms of population and number of housing units between 2010 and 2014-15. Housing data is to 2014 due to data availability. Table 11, drawn from the Demographics Services Center at the Wisconsin Department of Administration, shows population projections through 2035.

Table 10 City of Sun Prairie Change in Population and Housing Units, 2010-2014/15

2010 Population	2015 Population	Percent Change (%) 2010-2015	2010 # of Housing Units	2014 # of Housing Units	Percent Change (%) 2010-2014
29,364	31810	8.33%	12,413	12,756	2.8%

Data Source: Dane County and the City of Sun Prairie Comprehensive Plan.

Table 11 City of Sun Prairie Population Projections, 2010-2035

Population Change	5 year Growth %	2015	2020	2025	2030	2035
Increase by same percentage each year	0.22%	2,352	2,378	2,405	2,431	2,458

Data Source: Demographic Services Center, Wisconsin Department of Administration

Problems or Additional Vulnerability issues

The City of Sun Prairie over the last 4 years has experienced significant commercial growth on the west side of the city limits. This commercial growth is principally comprised of large retail outlets that during any given time have a substantial volume of customers. As such, this creates a challenge for the City in any type of crisis or disaster situation for shelter, adequate resources, and evacuation. As additional large-volume retail space is being planned in the same area within the next 2 years, this challenge will only become more prevalent.

Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities for the City of Sun Prairie.

Mitigation Capabilities Summary

Table 12 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, or by themselves contribute to reducing hazard losses. The table also indicates which of these tools are currently utilized in the City of Sun Prairie.

Table 12 City of Sun Prairie Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan	Yes	
Zoning ordinance	Yes	In the process of updating
Subdivision ordinance	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	Part of Zoning Ordinance
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	Part of Zoning Ordinance
Building code	Yes	1 & 2 family dwelllings - Wisconsin Uniform Dwelling Code (SPS 320-325) 3+ Unit Residential, Public Building & Places of Employment - Wisconsin Commercial Building Code (2015 International Codes w/Wisconsin Amendments SPS 361-366) Plumbing - Wisconsin Uniform Plumbing Code (SPS 380-387) Electrical - 2017 National Electrical Code w/Wisconsin Amendments (SPS 316) Fire Prevention - Current Edition NFPA, SPS 307, SPS 314, SPS 328, SPS 330, SPS 340, SPS 343, SPS 375-379
Fire department ISO rating	Yes	ISO Rating 3
Erosion or sediment control program	Yes	Run through Engineering
Stormwater management program	Yes	Stormwater Utility
Site plan review requirements	Yes	Part of Zoning Ordinance
Capital improvements plan	Yes	
Economic development plan	Yes	Part of Comprehensive Plan
Local emergency operations plan	Yes	
Other special plans		Parks and Open Space

Flood insurance study or other engineering study for streams	Yes	FIRM/FEMA
Elevation certificates (for floodplain development)	Yes	Structures not allowed in the floodplain

Data Source: City of Sun Prairie Data Collection Guide

Table 13 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in the City of Sun Prairie.

Table 13 Responsible Personnel and Departments for the City of Sun Prairie

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Planning	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Engineering and Building Inspection	
Planner/engineer/scientist with an understanding of natural hazards	Yes		
Personnel skilled in GIS	Yes	Engineering	
Full-time Building Official	Yes	Building inspection	
Floodplain Manager	Yes	Planning	
Emergency Manager	Yes	Police Department	
Grant Writer	No		
GIS Data Resources – (land use, building footprints, etc.)	Yes	IT, Engineering, Planning	
Other Personnel	Yes	Public Works, IT	Director of Public Works, IT System Administrator

Data Source: City of Sun Prairie Data Collection Guide

Table 14 identifies financial tools or resources that the City of Sun Prairie could potentially use to help fund mitigation activities.

Table 14 Financial Resources for the City of Sun Prairie

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Eligible but distributed by County
Capital improvements project funding	Yes	City Council
Authority to levy taxes for specific purposes	Yes	City Council
Fees for water, sewer, gas, or electric services	Yes	City Council
Impact fees for new development	Yes	City Council and Utility Boards- Sewer, Water and Light, Stormwater
Incur debt through general obligation bonds	Yes	Parks and Traffic
Incur debt through special tax bonds	Yes	
Incur debt through private activities	No	

Additional Capabilities

The Data Collection Guide identified the following additional capabilities for the City of Sun Prairie:

- Fire safety trainings that include Station Tours / Education, On-Site Tours / Education, Annual Open House, National Night Out / Safety Picnics, Fire Truck Ride to School, Citizens Academy, Leadership Group, Government Day, Live Burns, Web/Facebook Safety Campaigns, Firewatch Newspaper Column, Car Seat Install / Education, Fire Extinguisher Training, OSHA Compliant Smoke Alarm Installation, Senior Citizen Safety

National Flood Insurance Program Participation

The City of Sun Prairie participates in the National Flood Insurance Program. Refer to information provided in Table 15.

Table 15 Floodplain Regulatory Program Status as of 5/2016

Floodplain Ordinance	Dane County FIRM Panels	NFIP Partici-pation	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date
Yes	Numerous – See index	Yes	11/04/1973	01/17/1991	09/17/2014	12/11/1995

Data Source: FEMA Community Status Book Report

Public Involvement Activities

The City of Sun Prairie community participated in the County public outreach process. This was a series of public workshops held around the County in which an overview of natural hazard mitigation was given and the County plan was discussed. Residents were then given the opportunity to give their input on mitigation actions that could be taken, and filled out informational surveys that assessed the level of risk the perceived within their own community. More information on these meetings can be found in the County base plan.

Mitigation Actions

Completed Mitigation Actions

This is the first Natural Hazard Mitigation Plan completed by the City of Sun Prairie as part of the Dane County process. However, past local natural hazard mitigation plans have been made locally, and action has been taken to implement these plans Those actions have revolved around the mitigation of flooding in the wastewater treatment plant and associated infrastructure. The City of Sun Prairie submitted the following summary of these actions:

1. The City's wastewater treatment plant has never flooded as a result of a significant rainfall event. One of these significant events occurred in June, 2008 where a total of 9.57 inches of rainfall was recorded from June 5-13 with 2.32 inches recorded on June 8 and 4.25 inches recorded on June 9th. We did have one subdivision that did experience sewer backups. This problem was addressed in 2009 when 10,570 feet of clay sewer was lined, 179 wyes grouted and approximately 2,770 clay sewer joints were grouted along with 131 wyes. Since this was done, had no more problems with sewer backups in this area.

2. Sewer Capital Projects Plan. Over 32 miles of clay sanitary sewer pipe was televised from 2007-2011. Based on the television inspection reports, a 10 year Sewer Capital Projects Plan was developed with an annual budget of around $450,000. Repairs to the sewers were started in 2012 and are projected to be completed by 2022.

3. The City continues to do flow monitoring looking for sources of inflow and infiltration (I/I). Starting in April, 2015 flows were monitored in all of the City's major sewer Basins. From there, plan was to focus on Basin(s) that exhibited the highest flow after a major rain event. Unfortunately, we have not had any major rain events (as of 8/26) in 2015. However, we did relocate flow monitors to Basin serviced by the Bird Street Interceptor as flows did increase more in this Basin after rain events. In late July, the Bird Street Basin was divided up into five smaller Sub-Basins with monitoring continuing. Trying to find Sub-Basin(s) that shows highest increase in flow after major storm event. Next step would to develop cost effective plan for reducing I/I.

4. After a significant rain event in June 2000, 35 homes reported sewer backups. In 2001, the City received a $30,000 Hazard Mitigation Grant for installing back water valves. Letters were sent to 93 homeowners, included the 35 homes that did experience a sewer backup, along with an additional 58 homes that were in areas that had experienced a backup in the past or may

experience a backup in the future due to location. Homeowners were asked if they wanted to participate in the Sewer Back Water Valve Rebate Program. Only 39 homeowners participated in the Program. Homeowners contracted with licensed plumbers to have back water valve installed and then submitted invoice to City for reimbursement. Total cost for installing back water valves was $21,933.15

5. Since 1988, the City has required all new construction to install a back water valve.

6. Over the past 5-7 years, the City has done much work related to upgrading and installing new storm sewers and storm water detention basins. This work has reduced street flooding and has also helped reduce inflow into the sanitary sewer system. Additional storm water projects have been scheduled for 2016-2020 as part of the City's Capital Improvement Plan.

Proposed Mitigation Actions

Objective 1: Continue to implement sound floodplain management practices through continued compliance with the National Flood Insurance Program, to include floodplain ordinance enforcement and periodic review, promoting the benefits of flood insurance, and continued staff training and development in floodplain management.

Steps:

1) Evaluate through the existing staff, County planning staff, and additional DNR staff if necessary, the regulatory deficiencies and enforcement shortcomings in flood-related ordinances and programs (see related County objective).
2) Periodically update ordinances as necessary.
3) Ensure that stop work orders and other means of compliance are being used as authorized by each ordinance.
4) Suggest changes to improve enforcement of and compliance with regulations and programs.
5) Encourage floodplain management staff to become Certified Floodplain Managers (CFM) or maintain their CFM status.
6) Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps
7) Utilize recently completed Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits.
8) Promote and disperse information on the benefits of flood insurance, with assistance from partners such as the County, WDNR, or ASFPM.
9) Evaluate the potential costs and benefits of becoming a participant in the Community Rating System.

Lead Implementing Agency: Public Works Department

Supporting Agencies:

- Dane County Planning and Development
- Lakes and Watershed Commission
- Land Conservation Department
- Association of State Floodplain Managers
- Wisconsin Department of Natural Resources

SUN PRAIRIE
PUBLIC LIBRARY

2019 FAST FACTS

VISITS
225,660

REGISTERED BORROWERS
23,616
68 % OF RESIDENTS

CIRCULATION TOTAL
618,390
53% CHILDREN'S ITEMS

DOWNLOADS
66,017

MATERIALS OWNED

	IN-LIBRARY	ELECTRONIC
	114,598	157,350
	11,176	55,245
	15,981	952

WI-FI SESSIONS
297,008

COMPUTER USE
19,671

TOTAL PROGRAMS
716

CHILDREN'S	451
TEENS	67
ALL AGES	198

TOTAL PROGRAM ATTENDANCE
30,876

CHILDREN'S	25,454
TEENS	1,254
ALL AGES	4,168

Data is based on preliminary statistics from the WI Department of Public Instruction

Racial Literacy Plan 2020-2021

Vision:
The Sun Prairie Public Library serves as a dynamic, positive force in the community. We connect residents with the world of ideas, literacy, literature, and information and aspire to create opportunities for all residents to participate, connect and discover innovative, traditional, and emerging library resources and services.

Mission:
The Sun Prairie Public Library serves the community as an activity center to support lifelong learning by providing educational, cultural and recreational opportunities for all people.

Core Values:
Serving with Integrity
Providing considerate and inclusive service that respects all community members and their information needs, privacy, and right to intellectual freedom. We are committed to the responsible stewardship of library materials and spaces.

- We are transparent in our words and actions.
- We practice empathy.
- We are accurate and consistent.
- We respect privacy and opinions.
- We provide data-driven decisions that lead to effective outcomes.

Striving for Excellence
Rising to new challenges and opportunities by embracing creativity and change through innovation. We are highly skilled, knowledgeable, and caring and we cooperatively construct a healthy organizational culture that allows each of us to thrive.

- We actively support and empower each other.
- We offer quality programs, materials, and resources that are accessible to all.
- We build and maintain authentic connections with our community members and each other.
- We stay on the leading edge of technology.

Engaging the Community
Building connections with community members and organizations. Our services, resources, and gathering spaces are inclusive and we engage in the civic live of the community by incorporating engagement opportunities for residents of all ages and interests.

- We develop collections that meet diverse needs and interests.
- We actively seek feedback and input from community members.
- We keep our fingers on the pulse of the community.
- We reach out to and engage with the entire community through library outreach programs, a variety of media sources, social media and technology.

  In light of the increased unrest due to the systemic racism prevalent in the United States and the focus on the Black Lives Matter movement, the Sun Prairie Public Library is committed to enhancing racial literacy. Racial literacy can be defined as those skills that "probe the existence of racism and examine the effects of race and institutionalized systems on their experiences and representation in US society." (Sealey-Ruiz, 386)

  The Public Library Association (PLA), a division of the American Library Association (ALA), calls on public library workers to commit to structural change and to taking action to end systemic racism and injustice. This Racial Literacy Plan is our commitment and action plan.

Racial literacy for our staff and patrons will involve creating learning opportunities, that will enable our community to identify racism, bias, micro-aggressions, the history of systemic racism and to develop strategies for countering it within our own professional practice and hopefully eradicating it. We will accomplish this by:

1. Providing professional and staff development opportunities
    a. Dane County Library System, Ripple Project. Development of Regional Equity Teams.
    b. City of Sun Prairie Equity Academy
    c. Conferences
    d. Webinars
    e. Professional reading
    f. On-site and/or remote staff training and discussion
2. Reviewing policies and procedures
    a. Changing and/or abolishing practices that are identified by library research as systemically racist
    b. Review and revise protocols for involving police in patron interactions
3. Intentional programs
    a. Book clubs
    b. Panel discussions

    c. Cultural appreciation
4. Collection Development
    a. Audit of materials and selection criteria
    b. Displays
    c. Readers advisory
    d. Provide opportunities to create content
5. Representation
    a. Staffing initiatives
    b. Hiring local and national experts and to lead staff development and community discussions
    c. Developing internship programs
    d. Establishing focus and advisory groups
    e. Providing opportunities for community members to share their knowledge, skills and talents with others
    f. Library Board representation

Sealey-Ruiz, Yolanda. “Building Racial Literacy in First-Year Composition.” Teaching English in the Two Year College, vol. 40, no. 4, 2013, pp. 384-98.

SUN PRAIRIE PUBLIC LIBRARY

MISSION

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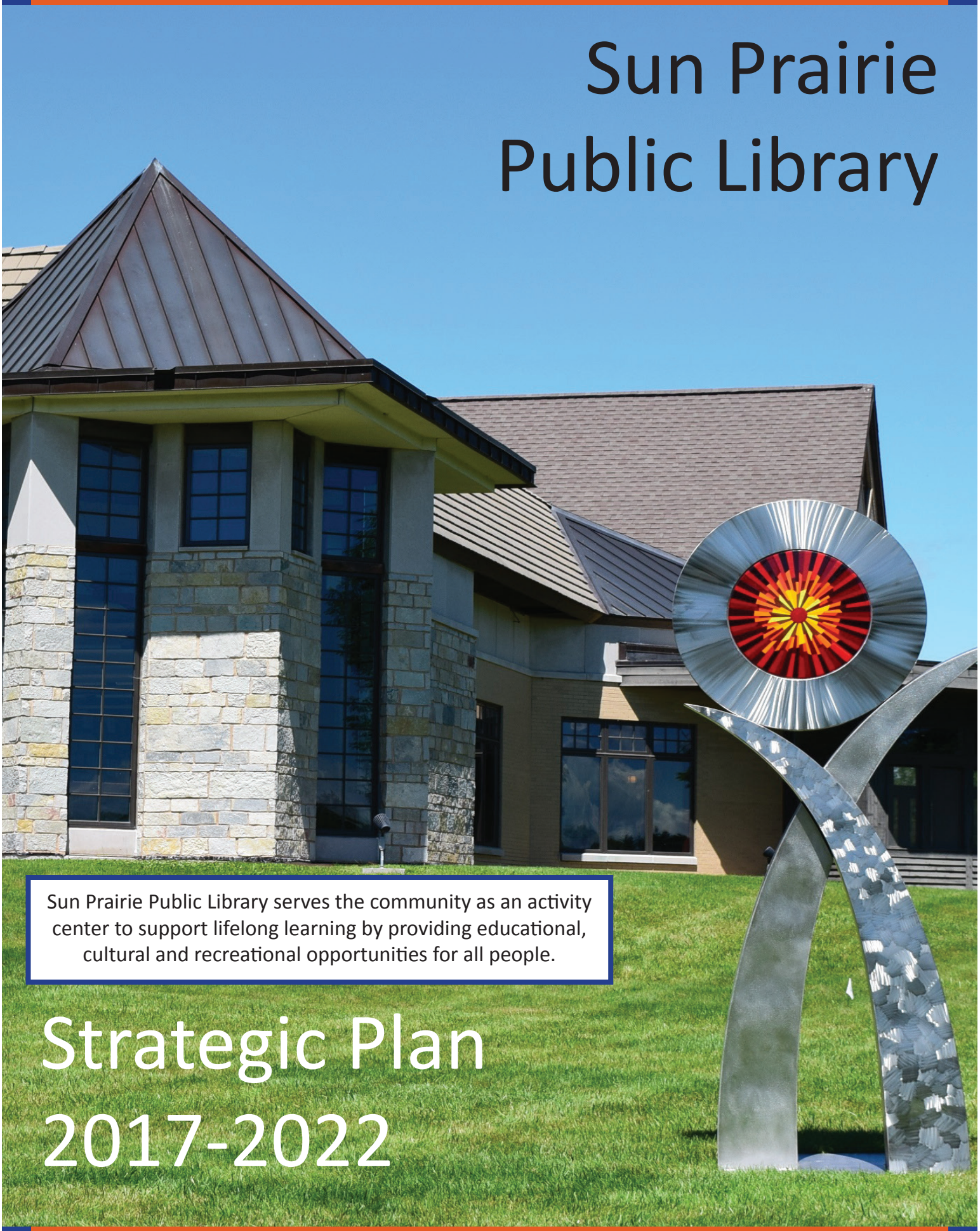
Sun Prairie Public Library



Sun Prairie Public Library serves the community as an activity center to support lifelong learning by providing educational, cultural and recreational opportunities for all people.

Strategic Plan 2017-2022

GOALS AND ACTIVITIES

1: Enhance Library Facility and Spaces

Ensure the library provides suitable spaces that meet the current and future needs of the community to deliver effective library services.

- Assess and enhance the current space.
- Explore associated costs for expansion to meet the needs of our growing city.
- Optimize comfort and service with contemporary furnishings and equipment.
- Explore the feasibility of library branches.
- Improve the user experience by enhancing point-of-service and navigation.
- Consider features that are relevant to our community's needs in terms of private work spaces, additional programming spaces, dedicated teen and creation spaces, and restroom renovations.
- Develop and maintain an aesthetically pleasing and welcoming outdoor space for programming and general enjoyment.

2: Increase Funding and Staffing to Meet Service Needs

Ensure best practices so that staff is prepared to meet current and future needs.

- Add additional library staff to adequately meet current service needs.
- Provide continuing education opportunities to all library staff.
- Attract and retain talent with competitive compensation.
- Provide quantitative and qualitative data for advocacy and support.
- Continue to pursue diverse funding sources.

3: Access

Ensure equitable access to all physical and digital library services and resources for residents of all ages and abilities.

- Explore hours of library operation to meet the community's needs.
- Explore website redesign for easier navigation and way finding.
- Review and adjust policies and procedures to eliminate barriers.
- Explore the expansion of outreach efforts.
- Explore tools for increased digital access and ways to increase awareness and use of all the library's services and resources.

4: Partnerships and collaborations

Collaborate and build partnerships to expand service capacities and leverage resources to increase engagement with the library.

- Collaborate with other city departments, community service organizations, schools, and local businesses.
- Identify business and community experts to share knowledge.
- Provide listening sessions for community discussion on a variety of topics.

5: Marketing and communications

Increase awareness and use of the Sun Prairie Public Library by crafting a clear and recognizable brand.

- Develop a vision statement and organizational values that tie into the mission statement.
- Develop a logo design.
- Create regular communication channels for patrons to receive news and updates.
- Actively take part in traditional and emerging media, including social media.

The complete Strategic Plan can be found on our website, *www.sunlib.org*, "About the Library", "Strategic Plan 2017-2022".